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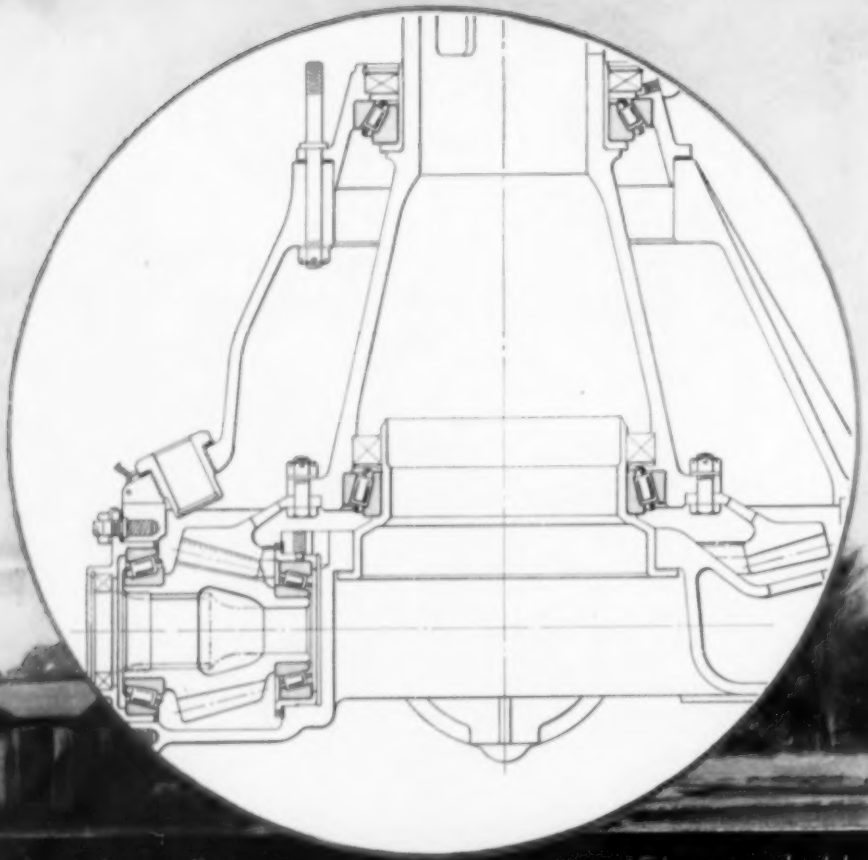

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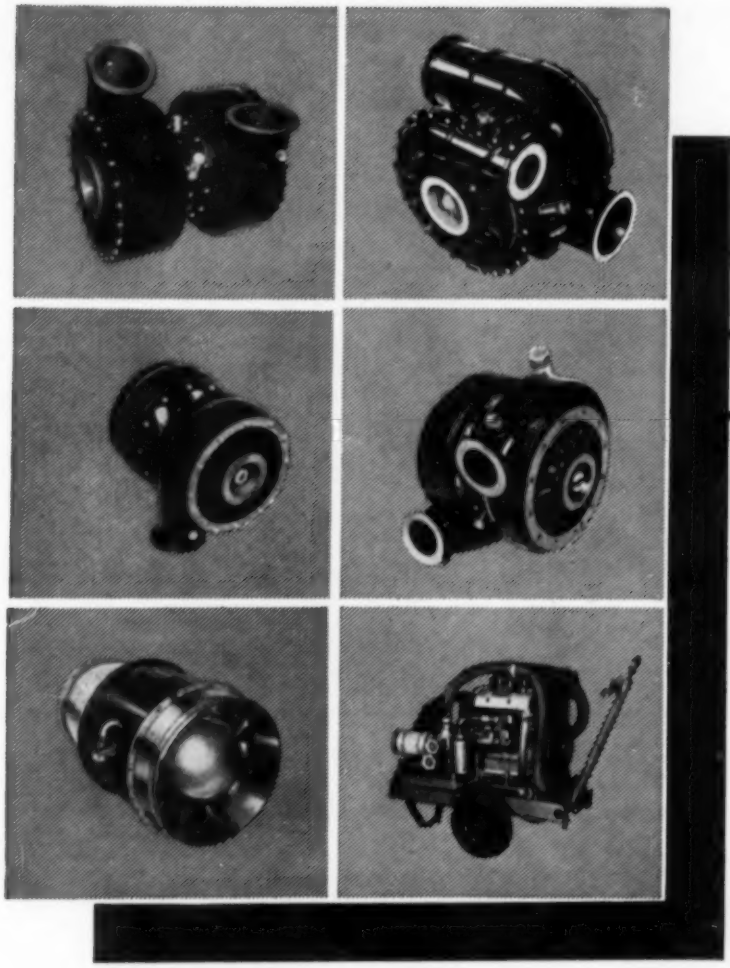

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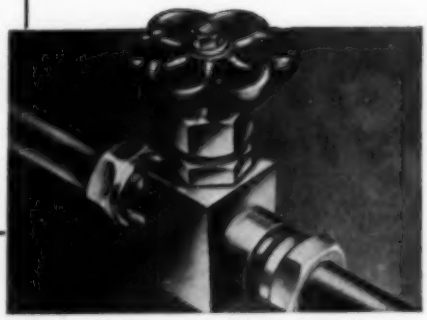

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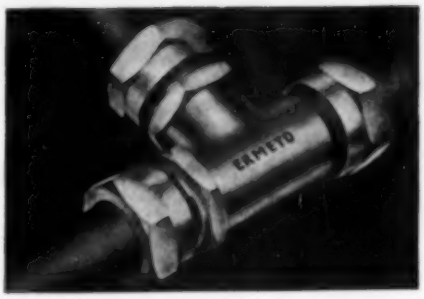

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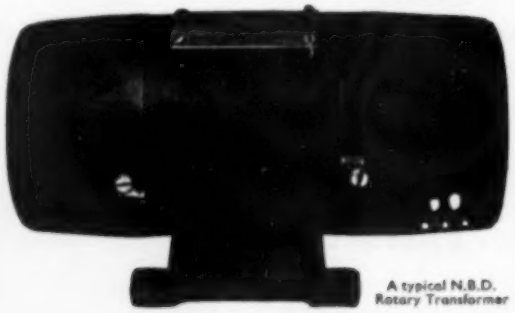

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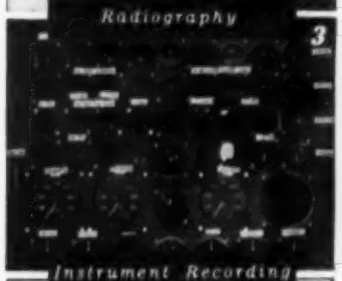

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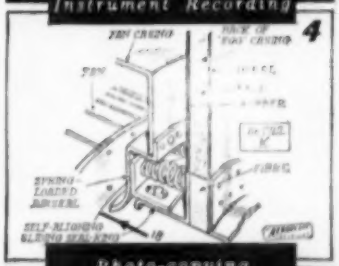

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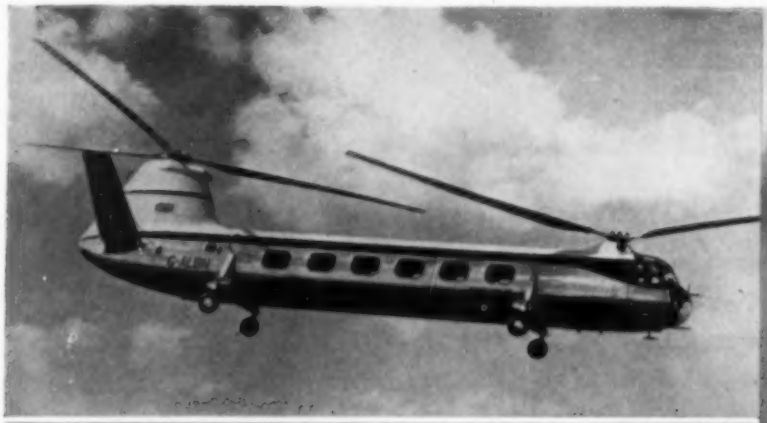

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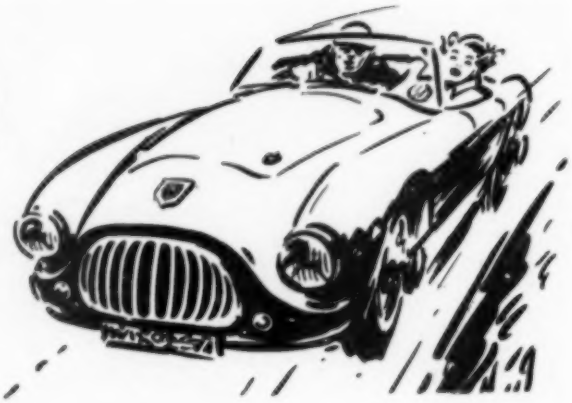

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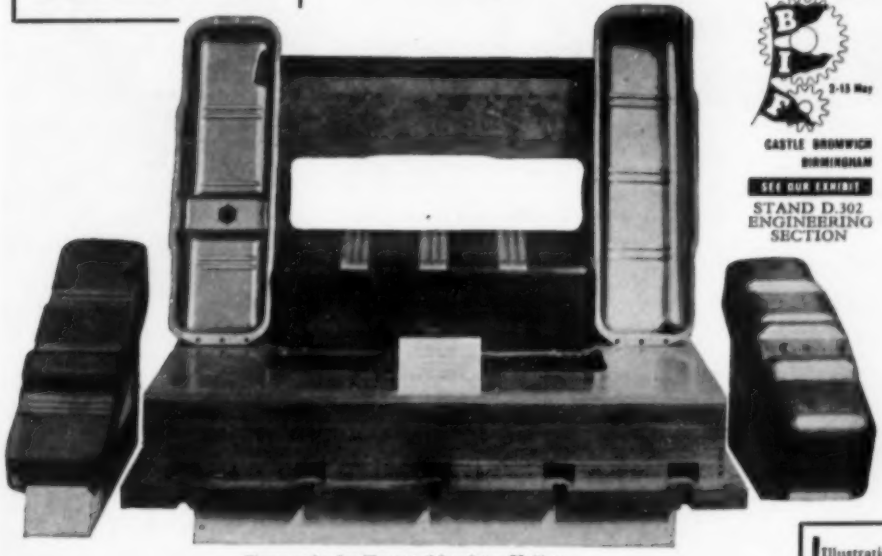

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Illustration shows "Hy-du-lignum" Press Tool, used on DH 600 Clearing, Treble Action Press for 20 gauge mild steel Petrol Tank Body Pressings. Interchangeable Punches and Ejectors with common die and pressure plates to produce top and bottom body halves, 3 ft. long × 10 in. wide × 8 in. deep. Photograph by courtesy of Morris Motors (Radiators) Limited.

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Aircraft Carriers Today

THE carrier controversy—it centres on the question whether aircraft carriers today represent value for money—is one that has raged for a long time, one that has received a new impetus with the coming of atomic weapons, and one which is unlikely ever to be settled. To avoid possible misconceptions, we must state at once that we have no intention of becoming directly embroiled in the argument, or of presuming to pronounce in favour of either side. Nor should any special significance in this connection be attached to our decision to devote a number of pages in this issue to a review of British aircraft carriers.

It must be apparent to everyone that the popularity of the aircraft carrier as a first-line weapons system has lately been subject to a favourable pendulum swing. Even the antagonists at home are probably British enough to have an affection for aircraft carriers as such, just as, instinctively, they have for all ships; but that is not the subject of dissension.

These self-contained air forces afloat seem to have regained ground in official and public esteem; one main reason, we believe, is the great increase apparent in fighting efficiency of the modern carrier. New devices to assist and make safer carrier flying, new radar and, especially, new aircraft with performance immensely superior to that of their predecessors—these are the things that have given a new lease of life to the aircraft carrier. And this has happened in spite of the development of nuclear weapons. In fact, aircraft capable of carrying atomic bombs can now be operated from the large carriers.

We have already stated that the controversy is unlikely to be settled. Any new hot war would no doubt show whether or not a carrier force could defend itself from successive enemy air attacks. But even this would only be part of the answer, because such a naval formation is now seen as a highly mobile advanced striking force, and it might well be able to justify its existence before it is even located by the enemy. A case for the carrier and a description of its new devices (though not on this occasion its new aircraft) may be found in the review to which we have referred.

Individual Action

ONE outcome of the nuclear developments which have been keeping the capitals of the world buzzing is to place a premium on the initiative and skill of the individual and the efficiency of small groups. In the past, so long as the seat of government has been intact and the lines of authority and communications have remained open, the conventional methods of conducting a war and of administering a country could be carried out. But on this we can no longer reasonably depend.

The Chief of the Air Staff referred in a recent speech at the Royal Air Force Flying College to the possibility of squadrons and stations having to fight on as autonomous units. This provides one example of the increasing reliance to be placed on the individual. It emphasizes the need to select commanding officers with tremendous care, and to give them every opportunity to become experts in the operational and technical aspects of their Service's work, as well as in administration. The same trend is seen in the picking of captains (in future to be of a rank not lower than flight lieutenant) and crews for our new V-bombers. Their responsibilities will be immense, far transcending anything hitherto experienced in this field of operations.

It is after the initial phases of nuclear warfare that a country might have to depend most upon the initiative of isolated groups of individuals. It is not difficult to imagine the importance in such circumstances of even a few dozen active communities. If these could be joined in a short time by other self-contained mobile units with their essential services intact, a first step towards survival and reorganization would be possible. We see in this depressing picture another new role for the aircraft carrier and its squadrons; it is perhaps, no more than an extension of the Royal Navy's traditional task of keeping the seas so that vital supplies shall be able to reach our shores.

FROM ALL QUARTERS

Royal Heron

THE de Havilland Heron for the Queen's Flight is now awaiting delivery to Boscombe Down, where it is to undergo comprehensive testing and handling trials. It is an executive version of the Series 2 machine with four Gipsy Queen 30 Mk 2 engines of 250 b.h.p. each and with airscrews of D.H. two-bladed constant-speed type. The machine replaces one of the Vickers Vikings of the Queen's Flight stationed at Benson, Oxfordshire.

It will be recalled that the formation of the King's Flight was ordered by King Edward VIII in 1936. A. Cdre. Sir Edward Fielden was appointed Captain of the Royal Flight; he holds this post today. Prior to this, in 1929, the Prince of Wales had acquired a Gipsy Moth, which was painted in the red and blue colours of the Household Brigade.

The Royal Heron is equipped to carry six passengers and a crew of three. Behind the cockpit is a compartment for the radio navigator, and aft again is the cabin with six seats: two in front back on to the radio compartment, and four behind are in facing pairs, between which are folding tables. Concealed in each of the chairs is a back-type parachute, and the four aft chairs can be adjusted to the reclining position. Life-belts are stowed underneath each seat and two five-place dinghies are also carried in the aircraft. Each engine has Graviner fire-warning and extinguishing equipment, and full de-icing is installed, comprising pulsating rubber overshoes for the wings and a fluid system for the airscrews and windscreen.

The cabin colour scheme is grey and green. The chairs are upholstered in dark-green whipcord, the walls, carpet and fittings are soft smoke grey, and the curtains are patterned light green.

Exceptionally comprehensive radio equipment and navigation aids have been installed in the Royal Heron. They include two V.H.F. sets, STR. 12D and TR. 1985; a personal V.H.F. transmitter/receiver; M.F/H.F. communications equipment, AD. 97-108; AD. 401 intercom; automatic direction-finding AD. 7092D with suppressed loops; Mk 3 Gee; I.L.S.; Zero Reader; gyro compass CL.2B with AL. 3 pilot aid.

The Series 2 Heron with retractable undercarriage has a performance which is considerably better than that of the Series 1. The cruising speed at 8,000ft (65 per cent METO power) is 183 m.p.h., and the weak mixture cruise at 3,000ft gives 191 m.p.h. The loss of an engine is of less importance to the machine than is the case with almost any other light or medium-sized aircraft, and the sea-level rate of climb on three engines is 610ft/min. All-up weight is 13,000 lb and the normal payload 3,054 lb.

The Duke of Edinburgh, who is expected to be the principal user of the Heron, has already flown the type—though not, as yet, it is believed, the example which is soon to join the Queen's Flight.

Development Gnats

THE Government has decided to place an order for a development batch of Folland Gnat light fighters. This was announced by Mr. Selwyn Lloyd, Minister of Supply, on March 24th. Two months earlier—on January 26th—Mr. George Ward, Under-Secretary of State for Air, had said that it was not possible to decide whether to order the Gnat until it had been thoroughly evaluated as a military weapon for the R.A.F. This could not be done until the type had been flown and tested. The first prototype, features of which were illustrated exclusively in *Flight* of March 18th, should fly in the summer of this year, and the second in the autumn.

Atomic Ack-Ack

THE Atomic Energy Commission and Defence Department of the U.S.A. disclosed in Washington last week-end that America is to have atomic anti-aircraft weapons. Present tests in Nevada, it was said, would include the explosion of a nuclear weapon miles above the earth. The statement went on: "Because of their great power, atomic air-defence weapons will greatly increase our ability to repel an enemy air attack."

It was further remarked that, although such a weapon, exploded at great heights, could destroy aircraft within a considerable distance from the point of burst, the tests should occasion no damage or injury from blast, heat, or nuclear radiation to property or people on the ground.

It seems probable that, in service, the weapon would take the form of a rocket missile rather than a shell from a gun.

The 200th Freighter

AFTER a slow start, the Bristol 170 Freighter began to sell steadily four or five years ago, and it has now amply justified the faith which the Bristol Aeroplane Company have always had in its "rightness of design". Today it is in use in all parts of the world, doing a multitude of civil and military jobs.

Last Friday, March 25th, a British company accepted the 200th Freighter—G-ANVR, a Mk 32. Its purchasers, Air Charter, Ltd., already operate three Mk 31 ("short-nosed") Freighters, and they are now supplementing this fleet with a pair of Mk 32s, the second of which—the 201st Freighter—is due for delivery by about the time this paragraph appears. Four of Air Charter's Freighters will be used on their "Channel Air Bridge," largely between Southend and Calais, and schedules call for 32 round trips per day on this route, representing an eight-hour utilization per aircraft. Even greater utilization is expected to be possible later. The fifth machine will continue to work freight services inside Germany.

Handing over the 200th Freighter, Mr. Cyril Uwins, managing director of the Bristol aircraft division, paid tribute to the sub-contractors in 170 production—one of whom (Aviation Traders, of Stansted, responsible for wing centre-sections) is an associate company of Air Charter, Ltd. The managing director of Air Charter, Mr. F. A. Laker, accepting the aircraft, praised the type's reliability; although the overhaul period of the Hercules 734 was already in excess of 1,000 hours, Air Charter had never yet suffered an unscheduled engine change.

G-ANVR is a particularly good-looking Freighter, finished in the operator's red and white livery and bearing the name *Valiant*. It is equipped with a movable bulkhead between the hold and the 23-seat rear cabin. (Handing-over picture on p. 435.)

TO SERVE THE CROWN: First views of the de Havilland Heron Series 2 which, as related on this page, is to replace a Viking of the Queen's Flight. The cabin accommodates six passengers, the two forward seats backing on to the radio compartment and the remaining four, as will be seen from the interior view, being provided with tables. Safe, comfortable and speedy, the Heron is in all ways worthy of its high calling.

***LONDON'S NEW GATEWAY:** This view of London Airport Central—by B.E.A. photographer Harry Stewart—gives the best impression yet of the new buildings due to come into use on April 17th. As reported below, the passenger terminal will be used by B.E.A. and ten continental airlines, who together carry 75 per cent of London's air passenger traffic.*

L.A.P. Central Opening

APRIL 17th is the date when the first of the new passenger-handling buildings at London Airport will be brought into use. Until the whole group of buildings is completed and can accommodate all traffic, air services will be divided between the central area ("London Airport Central") and the present Bath Road site ("London Airport North").

All services of the following airlines will arrive at and depart from London Airport Central: Aer Lingus, Air France, Alitalia, B.E.A., Deutsche Lufthansa, Finnair, Iberia, Iceland Airways, Sabena, S.A.S., and Swissair. The following airlines will continue to use London Airport North: Air-India International, Airwork, Argentine Airlines, B.O.A.C., C.A.A., El Al, Hunting-Clan, K.L.M., National Greek Airlines, Pakistan International Airlines, Panair do Brasil, PanAm, Qantas, S.A.A., T.A.P. (Portuguese Airways), T.C.A. and T.W.A. Details of aircraft parking arrangements and a map of road traffic routes are contained in M.T.C.A. *Civil Aviation Circular No. 32/1955.*

Cranfield S.C.R. Dinner

THE inclusion of an emphatic and humorous version of the case for the Fleet Air Arm in a toast to the guests by Rear Admiral A. N. C. Bingley, R.N., O.B.E., formed the most unexpectedly enjoyable feature of a dinner at the College of Aeronautics, Cranfield, on Friday last. It was the seventh annual dinner of the Senior Common Room Society of the College, and an occasion which indeed reached the customarily high standard of such functions.

The health of the College was proposed by Prof. G. F. J. Temple, C.B.E., Ph.D., D.Sc., F.R.S., who, as a mathematician, spoke of the civilizing influence of mathematics on aeronautics. He was accordingly pleased with the newly-autonomous department of mathematics at Cranfield. On the College's present position, it must indeed be a source of pride to Sir Victor Goddard, until recently principal, that Cranfield was regarded so highly.

Deputising for Mr. B. W. A. Dickson, C.B.E. (acting principal and S.C.R.S. president), Prof. A. D. Baxter, M.Eng., F.R.Ae.S., replied for the College.

Sir Gilbert Flemming, K.C.B. (Permanent Secretary, Ministry of Education) proposed the toast to "The Society," and Mr. J. Kinsella, B.E., A.F.R.Ae.S., chairman of the Society, replied. He reported that six members of the academic staff had left Cranfield during the year, including Sir Victor Goddard, whose foresight had been appreciated even more since he left than before. After pioneering a novel educational project in the field of aircraft economics and production, Prof. J. V. Connolly was leaving at the end of the summer term. The newcomers included Dr. J. A. J. Bennett, professor of aerodynamics, and Dr. D. C. Brown, of the electrical department.

A suggestion for increased co-operation between industry and the College was to establish at Cranfield a summer school in aeronautics, at which free discussion of topical subjects could be of mutual benefit.

The development of early Naval aircraft was revealingly sketched by Rear Admiral Bingley (who next proposed the health of the guests), from the time when their Lordships had specified "for use over the ocean, a flying chart-house with a good look-out. ('Paragraph 2. A diagram of a chart-house is attached')." The greenhouse-like Avro Bison had resulted. Concerning the carrier-flying techniques of earlier years, the speaker dispensed an exquisite line which involved "throttling back to let the carrier overtake" if one overshot the deck. It must be recorded that Admiral Bingley did in fact well propose the health of the guests, in addition to his missionary work for the Fleet Air Arm.

Sir Edward Bullard, Sc.D., F.R.S., replied for the guests, and was followed by Sir Frederick Handley Page (chairman of the board of governors) who revealed that, although earlier he had urged few and short speeches (in view of a pressing engagement at Aintree next day), he now admitted they had in fact been well worth hearing.

The Britannia's Trials

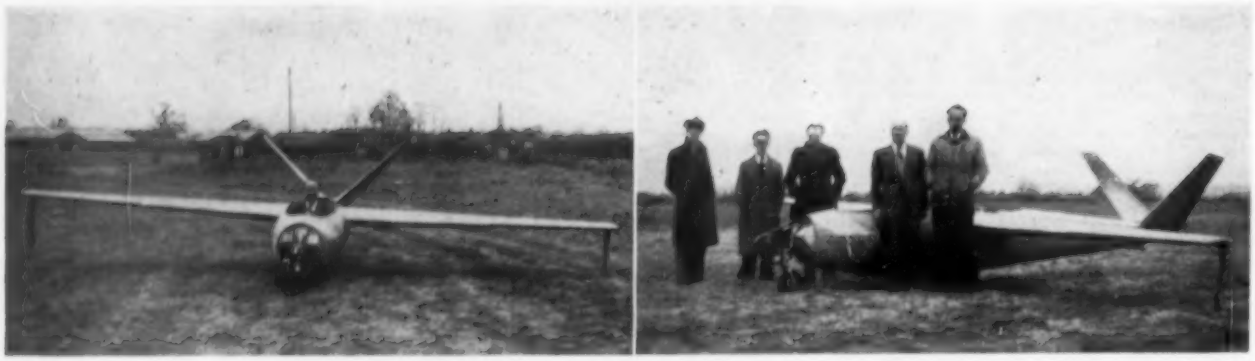
THE Bristol Aeroplane Co., Ltd., have released some details of the special equipment carried in the Mk 100 Britannia G-ANBA, now more than half-way through its tropical trials.

There are two automatic observer panels. The first is concerned with the performance of the engines and the associated systems, and its camera's maximum rate of operation is one exposure every two seconds, reducing progressively to one exposure every 55 sec. The instrumentation covers oil pressures and temperatures, airscrew and compressor speeds and rates of fuel flow. Its use is particularly important at take-off.

The second panel has a 35 mm camera capable of exposure at rates varying from four per second to one a minute. Here the instrumentation is concerned with airspeed, stability and control.

Ground equipment taken to Africa includes two F.47 cameras, which are positioned on a line parallel with the runway. (At

***BUILD-UP:** A peep inside the factory of Hawker Aircraft (Blackpool), Ltd., would today disclose scenes such as that above, with glossy-camouflaged, Avon-powered Hunters moving up the lines at a really heartening rate. The serial number of the first machine is WW648.*



BESPOKE: Reference was made recently to the first towed taxying trials of the S.K.1 light racer/trainer prototype, which is being built by Somers-Kendall Aircraft, Ltd. In these pictures taken at Woodley Airfield, Reading, J. Nat Somers is seen in the cockpit of the aircraft, which is shown minus cockpit enclosure, Palas turbojet (to be mounted behind the pilot) and nose fairing. The group includes some of the team who are working on the aircraft (left to right): Messrs. J. C. Chaplin, R. G. Kent, J. W. Caunter, J. N. Somers and H. M. Kendall.

FROM ALL QUARTERS . . .

Johannesburg, one camera was mounted on the control tower, so that the observer could keep in radio contact with the aircraft.) They have a wide field of traverse in the horizontal plane which enables them to record the take-off run. The film of the F.47 camera records position and bearing of the aircraft and stop-watch readings. These data, together with the distance of the camera from the runway, make it possible to calculate the height of the aircraft at any given point and its ground speed.

There is also an F.24 camera which is positioned at the end of the runway to photograph the aircraft at take-off and during the final stages of approach, at touch-down, and during the landing run.

All film is processed immediately in readiness for analysis and discussion. It is standard practice to work from negatives, since there is no time to print hundreds of feet of film, and in any case negatives permit slightly more accurate measurements than would prints.

The Britannia underwent preliminary sea-level hot-weather tests at Idris, North Africa, last autumn. In the current tests, the combined effects of heat and altitude have been tested from Johannesburg's Jan Smuts Airport, which is 5,600ft a.s.l. These trials comprised take-offs, landings and "accelerate-stops." In the last-named, failure of an engine at take-off is simulated and the aircraft is brought to a stop within as short a distance as possible by applying the brakes and reversing the airscrews.

At Khartoum the Britannia is completing the sea-level performance tests at even higher temperatures. The schedule includes long periods of level flying and low level climbs at various engine powers, and the aircraft will often be taking off at the hottest part of the day for flights of up to five hours' duration.

This second phase of the trials began with the Britannia's arrival at Khartoum on Saturday. The makers announce that "preliminary analysis of the results of the Johannesburg trials indicates that expectations have been exceeded."

George H. Hawkins

IT is with much regret that we record the death of Mr. G. H. Hawkins, who was the advertisement and business manager of *Flight* from its inception in 1909 until he retired owing to ill-health in 1938.

George Hawkins's connection with this journal, however, went much further back than 1909. As a young man in 1897 he joined our founder and first editor, Stanley Spooner, to run the business side of *The Automotor and Horseless Vehicle Journal;* this was later to become the *Auto*, a journal that devoted one page each week to aeronautical subjects and was the forerunner of *Flight*, which began its separate existence in January 1909.

Many of our older readers in the industry will remember George well. He was of a kindly disposition, with a strong sense of humour. He had a fund of stories concerning the industry in its earliest, struggling days, when constructors whose names are household words today had to give serious consideration to finance before a few pounds could be spent on advertising their wares.

For the years George Hawkins was with us *Flight* was his whole life, nothing being allowed to stand in its way. Unfortunately he suffered severely from asthma and it was this which caused his premature retirement shortly before the war. He was 76 when he died.

Reappointments at A.W.A.

FOUR major executive changes at Sir W. G. Armstrong Whitworth Aircraft, Ltd.—announced last week by Mr. H. M. Woodhams, managing director—include the appointment of Mr. Sidney W. D. Lockwood, O.B.E., A.M.I.P.E., A.F.R.Ae.S., as general manager. Mr. Lockwood, who was formerly works director, now has the title of works director and general manager. He previously held the appointments of production manager and works manager.

Mr. Henry R. Watson, B.Sc., A.F.R.Ae.S., chief designer, succeeds Mr. John Lloyd, F.R.Ae.S., as technical director and has been elected to the Board. Mr. Lloyd, who has retired, remains on the Board as a director.

The new chief designer is Mr. Edward D. Keen, F.R.Ae.S., who has been assistant chief designer since 1948.

Mr. Watson has just returned from Woomera, where A.W.A. have a rocket installation, and a tour of the U.S.A. in order to study rocket development there. Graduating from Birmingham University in 1920 as a B.Sc. in mechanical engineering, he joined A.W.A. He became chief technician in 1939, and in recent years he has been responsible for design work on the N.F.11 and various transonic and supersonic aircraft.

Mr. Lloyd's retirement marks a long association with A.W.A., where, in earlier days, he was responsible for the design of such famous aircraft as the Siskin and Atlas fighters, the Argosy, Atalanta, Ensign and Apollo airliners, the Whitley bomber and the A.W. 52 experimental "flying wing."

Mr. Keen joined A.W.A. after obtaining a London University honours degree in engineering in 1928. He has held appointments as research engineer and deputy chief technician and, in 1948, was appointed assistant chief designer. Last year, he was awarded the Simms Gold Medal for his paper and work on integral construction of aircraft.

A.W.A. QUARTET: The four executives of Sir W. G. Armstrong Whitworth Aircraft concerned in the changes referred to above. Left to right: Messrs. Lockwood, Watson, Lloyd and Keen.

MARITIME BRITANNIA

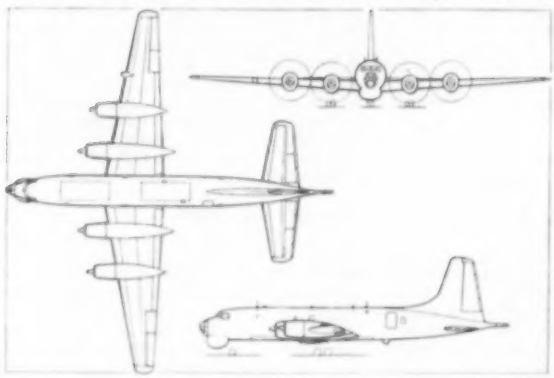
First Particulars of Canadair's CL-28

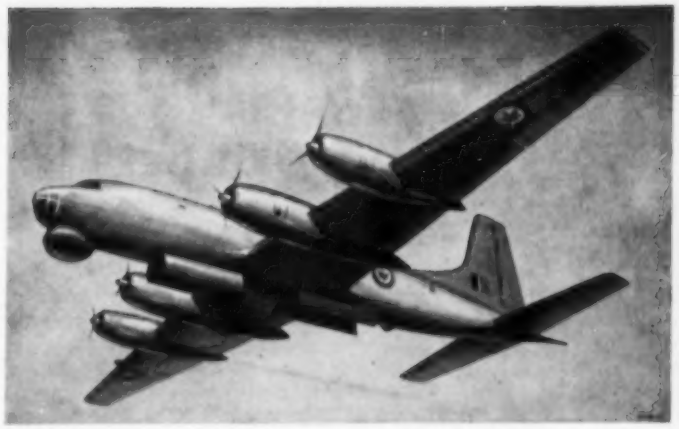
THE maritime reconnaissance version of the Bristol Britannia for the R.C.A.F.—the first example of which is now taking shape at the Montreal plant of Canadair, Ltd.—has hitherto been regarded by the Canadian authorities as being more or less secret, though the essential features of the project have been known for many months. Now, with acknowledgment to *Canadian Aviation*, we are able to publish the first authentic drawings and a useful amount of detailed information.

The initial R.C.A.F. order for CL-28s (to give the aircraft its Canadair type-number) is for 13, with a possible extension to 50. Present value, including equipment, is said to be $185 million, and delivery of the first aircraft is scheduled for early 1957. Compared with the Britannia airliner, 60 per cent of the CL-28 is new, or substantially modified—though the wing, tail surfaces, undercarriage and flight controls are unchanged, except for U.S. standardization.

With the exception of the undercarriage, for which Jarry Hydraulics, of Montreal, are responsible, the whole aircraft will be built by Canadair. The chosen engines are of the Wright Turbo-Compound R-3350-30WA type, of American manufacture, and will afford an endurance of the order of 24 hours. The crew will number 15, and in addition to a variety of anti-submarine weapons, 21 different radio and radar installations are planned. Maximum gross weight will be slightly less than the 150,000lb of the present Britannia.

About half of the fuselage is completely new in design, the other half being in some degree modified. A change in c.g. position has come about, and it has been necessary, due to the requirement for weapons bays, to transfer structural strength from the fuselage shell to floor beams. The nose embodies a forward observation (or low-level bombing) station, and there is a prominent radome beneath. In the extreme tail is a fixed magnetic airborne detector boom.





A "Flight" artist's impression of the M.R. Britannia, showing the doors of the two weapons bays open. Prominent features are the nose radome and the tail magnetic airborne detection "stinger." Below is a g.a. drawing; relevant dimensions are: span 142ft and length 122ft, the latter being 8ft more than for the present Britannia.

Alternating current is supplied from each engine by a Sundstrand constant-speed drive; the hydraulic system has been changed from 4,000lb sq/in to 3,000lb sq/in for the weapons-bay jacks, control-surface ground locks and nosewheel steering and brakes; and there is an entirely new air-conditioning system and a hot-air system of de-icing from fuel heaters.

Work is already in progress on tooling and manufacture of wing-skin panels and inner wing spars, and by the middle of 1956 the wings and tail should be complete. The rear, centre and forward fuselage sections are due for completion at the same time.

Titanium will replace stainless steel for the engine firewalls, and 600-900lb of this material will be used in each aircraft instead of 1,800-2,700lb of stainless steel. Metal bonding, using the American FM-47 tape process, will effect a further weight-saving by eliminating thousands of rivets as well as permitting the use of a thinner skin. Major structural parts of the undercarriage will be of 79S alloy instead of steel and should effect a further major weight-saving.

Spar booms are of 75S aluminium alloy and are said to have posed one of Canadair's most complicated tooling problems. *Canadian Aviation* reports: "These machined extrusions run the whole length of the wing at differing thicknesses. At the same time they have a symmetrical 4 deg twist machined to a tolerance of plus or minus 10 thou. This job is accomplished on an Ingersoll spar cap [i.e., spar boom—Ed.] machine using hydraulic flying clamps every five inches."

LECTURE ON ANALOGUE COMPUTORS

A HIGHLY specialized science—that of analogue computing—formed the subject of a Royal Aeronautical Society main lecture given on March 24th by Mr. K. V. Diprose, B.A., of A. V. Roe and Co., Ltd. The general purpose of the paper was to discuss the ways in which analogue computing could be of assistance to aircraft design and research in the future.

The lecturer pointed out that until a few years ago the only large computors were of the analogue type, and when the automatic digital computor became established in practical use it was widely suggested that the analogue machine was obsolete. This view, however, was now less widely held and even makers and designers of digital machines conceded that there was usually some place for the analogue computor.

Having stated his general theme Mr. Diprose went on to describe three types of computor most commonly used in aeronautics—the response simulator, the electrolytic tank, and the network analyser. He then used these examples to illustrate the particular properties of analogue computing and went on to suggest where these properties could be of most assistance to aeronautical engineers. Finally, he suggested criteria by which the merit of a computor could be assessed, and concluded by forecasting the trend of future development.

ANOTHER AIRFIELD GOES

SIX weeks ago, in a leading article, we deplored the growing number of airfields in the London region that are being closed down for one reason or another. The latest addition to the list (though unavoidably) is Langley. Airwork, Ltd., the tenants who share the airfield with Hawker Aircraft, Ltd., as an engineering base have been given six months' notice to leave by the owners of the airfield—the Ministry of Supply.

During the war Langley was a major production centre for Hawker Hurricanes, and later for Typhoons and Tempests. The airfield has remained a major production unit for Hawker aircraft and at present Hunters are being assembled there (they are test flown at Dunsfold). Since the war the site has been used as a centre for civil aircraft maintenance and repair and was also used for a short time as the main servicing base of the now defunct British South American Airways Corporation. Use of Langley has been increasingly limited by the proximity of London Airport, which is only two miles away; the circuits overlap.

Recently L.C.C. housing development has taken place on the fringe of the airfield, and now Slough Council have decided to approach the Ministry in order to acquire the site for municipal housing purposes. Airwork have not yet decided on the location of a new engineering base, but the Hawker factory is to remain.

HERE AND THERE

BEFORE THE MAST: Now serving with the United States Navy is this fantastic variant of the Douglas Skymaster—the R5D-2 flying meteorological laboratory. Beneath the wings are four massive radar installations, and the 15ft mast can be raised or lowered in flight "for meteorological readings."

Flying Doctor Service Honoured

FOLLOWING her visit to Australia during her Commonwealth tour, the Queen has granted permission for the Flying Doctor Service to be known in future as the Royal Flying Doctor Service of Australia. Her Majesty saw something of the valuable work which the Service performs, and the new title perpetuates her appreciation of it.

Royal Visit

ON April 20th the Duke of Edinburgh is to visit the Duxford works of Aero Research, Ltd.

Joint Missile Plan

THE Director of the Norwegian Defence Research Institute has stated that Norway and the Netherlands are studying the possibility of joint production of guided missiles. Four scientists at each of the defence research institutes in the two countries are working on the matter and will complete their report by the autumn. It is as yet questionable whether Norway could afford to take part in such a project.

Cooksey's Record Beaten

TWO Swedish Air Force pilots—Captain Hans Neij and Pilot Sergeant Birger Eriksson—claim a new international speed record over 1,000 km by flying two Saab S-29C reconnaissance aircraft (Swedish-built Ghost) at an average speed of 559.85 m.p.h. The previous record was held by former Gloster test pilot Jim Cooksey, who, on May 12th, 1950, flew a Meteor F.8 over 1,000 km at an average speed of 510.925 m.p.h.

Scooped Again

THE scoop net designed by Lt-Cdr. John Sproule (see *Flight*, January 21st) was used in another successful helicopter rescue last week when two young men, whose sailing dinghy had capsized off West Wittering, were picked up successfully; Lt. J. Walden flew above them and picked up one in the net and the other by sling and winch. The first actual life-saving use of the scoop net had been made the previous week, when Lt-Cdr. Sproule picked up a ditched Firefly pilot off Littlehampton.

Ground Attack

REINDEER owners in Northern Norway have been suffering badly from the depredations of wolves among the herds, and the Norwegian Air Force High Command has given permission for Service aircraft to engage in a hunt.

CF-100s at C.F.E.

THREE Avro Canada CF-100 all-weather fighters of the R.C.A.F. arrived at the Central Fighter Establishment, West Raynham, late last Sunday night after a 3,155-mile flight from Montreal, having first landed at Kinloss, Morayshire. They will undergo evaluation trials by the R.A.F. before joining the Canadian Air Division in Europe.

Brought to Book

AMONG subjects of criticism in the Auditor-General's Report on the Air Services Appropriation Accounts, 1953-54, published last Monday, are disposal of a £15,900 stock of R.A.F. engine spares, through a series of mistakes, for £10; losses through the conversion of a landing-craft maintenance vessel into a flying-boat depot ship, and the subsequent abandonment of the project; and losses through over-issue of ration allowances on a number of occasions when R.A.F. leave had been granted in excess of entitlement. On the other hand, the report states that gross expenditure in 1953-54 showed a saving of £83,208,843 on the estimated expenditure of £517,909,166. We hope to deal with the report in greater detail next week.

Air Attaché's Party

SOME 350 guests were present last Monday evening at a reception given at Claridge's by the Thai Air Attaché, A. Cdre. Harin Hongskula, and Madame Hongskula, to celebrate Royal Thai Air Force Day.

Avro Canada Loss

A SIX-MONTH setback in research and testing may result from a fire in an Avro Canada hangar at Malton Airport on the night of March 23rd. The monetary loss is put at £1,785,000. The outbreak appears to have been caused by a short circuit in a switch box; and a storm, with 80 m.p.h. winds, was raging at the time. Included in the material destroyed were two CF-100 Mk 4s, an Orenda-Sabre, an Orenda-Lancaster flying test-bed, and research equipment.

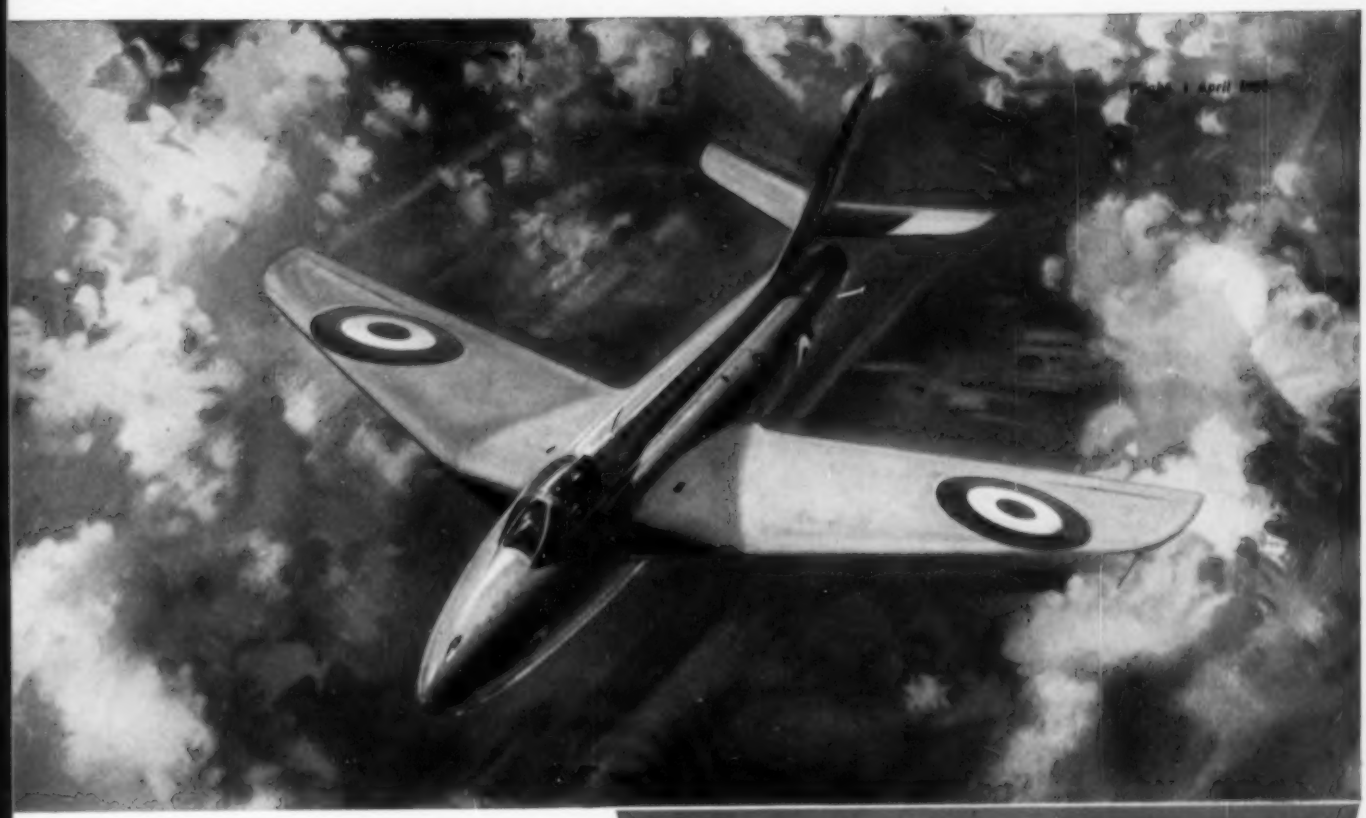
Lundy's Air Mail

A PROPORTION of the post for Lundy Island, in the Bristol Channel, is carried on the 25-mile flight by an Auster of Devonair, Ltd. (photographs appeared in *Flight* of December 24th last). Both ingoing and outgoing letters are stamped and are delivered against payment of the due in Puffins, the local currency. Two new sets of stamps were issued recently, one for air and one for surface mail, to commemorate the millenary of the last of the Norse kings in England, Eric Bloodaxe, who used Lundy Island as a stronghold. The air-mail stamps charmingly depict some of the Island's birds.

Capt. Pritchard on Tour

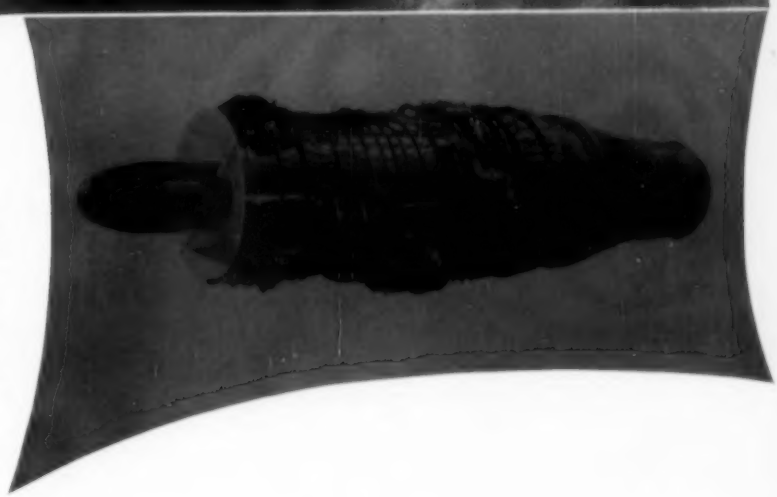
A LETTER to the Editor from Capt. J. Laurence Pritchard, Secretary of the Royal Aeronautical Society from 1925-1951, and now engaged on a lecture tour of America, shows him to be in good fettle, though hard-pressed. Since he left England on January 10th, he and his wife have covered over 10,000 miles. He has given 24 lectures to universities and other institutions; and has travelled by air, train or road from New York to San Francisco, Vancouver, Los Angeles, Inyokern and Dallas, whence he was due to press on to the Mississippi, Virginia, Washington and New York. He hopes to sail in *Mauretania* on April 12th. His lectures have been sincerely appreciated, and the film *The Story of the Century* has gone down "like wildfire."

PETALLED WASP: The Commonwealth CA-22 Winjeel, the new standard basic trainer of the R.A.A.F., is powered by a very accessible 550 h.p. Wasp—as was its predecessor, the Wirraway. Later Winjeels are to be powered by the Australian-designed geared Cicada engine.



The Sapphire

Super-priority for the Royal Air Force, the Hawker Hunter F.2 interceptor fighter is one of *eleven leading aircraft, on both sides of the Atlantic, powered by the Armstrong Siddeley Sapphire turbojet or its American counterpart — the Wright J.65/Sapphire.



*The Hawker **HUNTER F.2** *fighter* • *The Handley Page* **VICTOR** *crescent-wing bomber* • *The Gloster* **JAVELIN** *all-weather fighter*

The English Electric **P.1** *fighter* • *The Republic F.84F* **THUNDERSTREAK** *fighter & RF.84F* **THUNDERFLASH** *fighter*

The Grumman F9F-9 **TIGER** *fighter* • *The* **MARTIN B 57** *(Canberra) bomber* • *The North American* **FURY** *fighter*

The Douglas A4D **SKYHAWK** *bomber* • *The Lockheed* **F-104** *fighter*

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Capital Airlines
An impression of the Capital Airlines Viscount flying over the Capitol building, Washington
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VISCOUNT
FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES

RE-RISING SUN

The Japanese Aircraft Industry Ten Years After VJ-Day

IN 1944 the Japanese aircraft industry manufactured 25,000 aircraft. After her defeat Japan had virtually no aircraft industry for seven years, but she is now gradually re-asserting herself as a major industrial power in Eastern Asia (although it should be noted that the industrial capacity of China is enormously greater today than it has ever been before, and may already rival that of Japan). This is an appropriate time at which to present an overall survey of the Japanese aeronautical scene; far-reaching effects are certain to result from the almost complete Americanization of this potentially vast industry.

ACCORDING to the terms of the Armistice Agreement signed on board U.S.S. *Missouri* in the summer of 1945, the Japanese were not allowed to manufacture aircraft and related equipment. This ban was not repealed until 20 days before the Peace Treaty came into effect on April 20th, 1952, nearly seven years later. It is, therefore, three years to the day since Japan was permitted to engage in practical aviation. The following notes give an outline of what has been done in Japan during these three years. The broad picture revealed is that of a country desperately anxious to expand, to make and sell aircraft, to attract foreign technical assistance, to enjoy every scrap of American financial and material aid which might be forthcoming and, above all, to re-establish herself as one of the major aeronautical powers. Her technical ability at the moment is moderately good, the demand for her aeronautical products small but growing, her capacity to learn immense, and her ambition unbounded.

Aircraft Overhaul. Naturally enough, this was the first type of activity practised by the revived industry back in 1952. At this time, the needs of the Korean war were such that the U.S. Air Force was only too glad to farm out the less sophisticated repair jobs for its busy Far East Air Force to the numerous private Japanese firms who were looking for such work. The first aircraft entrusted to the Japanese were all piston-engined machines of such types as the North American T-6 Texan and F-51 Mustang. Having become proficient at repairing and overhauling such aircraft, the Japanese contractors were permitted to graduate to modern jet fighters and trainers, including the F-80, F-84, F-86, F-94 and T-33.

It is estimated that overhaul contracts so far completed for the F.E.A.F. involve over 1,500 aircraft with an aggregate contract value of 13,000,000 yen (£13,000). The companies concerned included Mitsubishi Heavy Industries Reorganised, Ltd., Kawasaki Aircraft Company, Showa Aircraft Company, New Japan Aircraft Company, and Shin Meiwa Industrial Company. The present capacity of the airframe repair and overhaul divisions of these companies has been recently estimated at 5,000,000 man-hours per year.

Aircraft Manufacture. The renowned companies of World War 2 have passed through ten years of hardship, disorganization and reorientation. Some have held together by entering non-aeronautical fields, but very few have been able to retain even a nucleus of fully-trained engineers from which an organization capable of designing and manufacturing aircraft could rapidly grow. Since April 1952, therefore, a close liaison has existed between the principal Japanese companies and various aircraft manufacturing firms in the U.S.A. The following is a synopsis of present activity in Japan.

Fuji Heavy Industries, Ltd. During the second world war, one of the principal aircraft companies was the Nakajima Organization. This firm was liquidated after the Armistice and its assets and factories were divided amongst twelve separate companies who established themselves in various domestic and industrial spheres. During the summer of 1953, a parent company, known as Fuji Heavy Industries, Ltd., was formed to organize the re-entry of this group into the aircraft field, and five of the original descendants of Nakajima were to have merged with Fuji by today, April 1st. Fuji intend to manufacture motorcycles, bus bodies and railway equipment, as well as aircraft to the value of £600,000 per month.

The principal aircraft factory is at Utsonomiya. In 1953, the group purchased manufacturing rights for the Beech T-34 Mentor, a standard basic trainer of the U.S.A.F. and U.S. Navy, and this aircraft was put into production in that year to meet the needs of the Japanese Air Self-Defense Force. The Kansas Company provided Fuji with considerable assistance, particularly in providing tools and technical instruction, and Japanese-assembled Mentors began to appear in the autumn of last year. The first batch of 46 have now been sold to the A.S.D.F., and deliveries are reported to have reached a rate of ten aircraft per month. Projects exist for developments of the Mentor for a variety of civil and military purposes.

Fuji are also proceeding with the development of a radio-controlled target aircraft for the A.S.D.F. The general design of this machine resembles the British M.L. or American Radioplane piston-engined targets and production is expected to start this year. Looking to the future needs of the A.S.D.F., Fuji have also prepared designs for two types of jet trainer. The first, designated FJT-21, is basically a turbojet development of the Mentor, powered by a Continental Marboré of 900 lb thrust, mounted low in the forward fuselage. This aircraft is expected to cruise at 250 m.p.h., and to be a useful liaison vehicle. Much more advanced is the FJT-51, which will have a highly-swept wing and a turbojet of approximately 4,500 lb thrust.

Kawasaki Aircraft Company. Another huge wartime firm, Kawasaki have now split into two divisions, Kawasaki-Gifu and Kawasaki-Kikai. The former are prominent in the repair and overhaul of aircraft of the American F.E.A.F. and have also established close liaison with the American Lockheed Company. A contract was signed in 1953 with Lockheed Aircraft Service (Overseas), Inc. under which Kawasaki are permitted to manufacture and overhaul the F-94C Starfire all-weather fighter and the T-33A trainer for the A.S.D.F. In this work the American company has offered considerable assistance in re-equipping the shattered factory at Gifu and in establishing production of these modern jet aircraft. It is expected that Kawasaki will, initially at

Six types of Japanese post-war aircraft: top row, Okamura N-25 (65 h.p. Continental); Toyo-Fletcher FD-25A (250 h.p. Continental); Kawasaki KAT-1 (260 h.p. Lycoming); bottom row, Shin-Tachikawa R-HM (90 h.p. Continental); Kawasaki KAL-1 (260 h.p. Lycoming); Shin-Tachikawa R-53 (155 h.p. Cirrus Major). It is apparent that Japanese designers have no inhibitions in the matter of layout.

Three more examples of Japanese aircraft: from the left, Fuji-Beech T-34A Mentor (225 h.p. Continental); Kayaba Heliplane (180 h.p. Continental); and Toyo TT-10 (135 h.p. Lycoming).

RE-RISING SUN . . .

least, build unequipped airframes, a considerable proportion of the accessory equipment being purchased from America. To start with, 150 T-33As are being assembled from Lockheed-built components, Kawasaki thereafter proceeding to make the aircraft from scratch. It was hoped that the first machines would be built this year, but difficulties have arisen with regard to the supplies of J33 turbojets (dealt with in the section on engines).

Kawasaki-Gifu have also designed two quite adequate light liaison and training aircraft, one of which, the KAL, bears a close resemblance to the Bonanza (although it has a tailwheel) and the other, the KAT, is generally similar to the Mentor. In the autumn of 1954 one KAL-1 and a pair of KAL-2s were sold to the A.S.D.F., and a KAL-1 was purchased by the Japanese Aviation College. These types are two of the most advanced "home-grown" aircraft to have appeared in Japan since the war. The purchase price of the KAL is quoted as approximately £13,000, not including £4,000 for radio equipment and spare parts.

Kawasaki-Kikai are at present the principal source of rotary-wing aircraft in Japan. The company purchased a manufacturing licence for the Bell 47 series of helicopters and, since January of last year, a number of deliveries of Kawasaki-Bell 47Ds have been made to both service and civilian purchasers. These helicopters are at present being made at the rate of approximately five aircraft per month.

Kayaba Industrial Company. Before the war, this firm manufactured Autogiros and aircraft undercarriages. In 1952, Shiro Kayaba, the founder of the firm, obtained the fuselage of a Cessna 170B and, during the following two years, turned it into quite a presentable convertiplane.

The normal 180 h.p. Continental engine, driving a fixed-pitch airscrew, has been retained but a three-blade rotor with a diameter of 36ft has been mounted above the cabin. Each blade of this rotor will eventually be driven by an Ishikawajima ramjet. Known as the Kayaba Heliplane, this curious machine is expected to be able to climb vertically and then cruise horizontally under the power of its piston-engine alone. It is known that tied-down testing took place late last year but no reports have been received of the machine's having flown.

Shin Meiwa Industries, Ltd. This company is the successor to the former Kawanishi Aircraft Company, which manufactured various types of civil and military aircraft, a considerable proportion of which were seaplanes and flying-boats. One of five large companies licensed by the Japanese Government to manufacture aircraft, Shin Meiwa plan to be in production with American designs before the end of this year.

In the second week of March, the *Nippon Times* reported that negotiations were going on between the company and Douglas Aircraft Co., Inc., with a view to manufacture of the latter's machines in Japan. It was stated that Mr. J. S. Farrar, of Douglas, recently visited Shin Meiwa and offered assistance in establishing the Japanese firm as an overhaul facility for large Douglas transports, such as the DC-6B, C-118 and C-124.

On their own account, Shin Meiwa have a light jet trainer in the project and mock-up stage. Designated KJT-01, this machine would be powered by an unspecified unit of 4,500 lb thrust and would be suitable for all forms of basic military training.

Mitsubishi Heavy Industries Re-organised, Ltd. Having lost their factory at Nagoya during the war, this great industrial group have erected a new plant on the edge of the airfield at Kumaki, some miles to the south-east. By far the biggest aircraft production programme in Japan is Mitsubishi's schedule for the manufacture of the F-86F Sabre. Mitsubishi have maintained close technical liaison with North American Aviation, Inc. since the end of 1952, and have since overhauled, and manufactured non-structural parts for, Sabres of the F.E.A.F.

The Japanese Ministry of International Trade and Industry have, with the co-operation of the American Government, been gradually formulating a plan for the manufacture of some 600 Sabres in Japan as a major item in the six-year build-up of Japan's defence forces. A conference was held during the latter half of last month with a view to establishing the attitude of both countries to this programme and determining how much of the financial burden should be borne by the Japanese Government. The Japanese Finance Ministry originally intended to transfer £1m from the American Mutual Security Agency Wheat Fund to the Sabre assembly programme, but it is believed that, following proposals made by Irving Roth, a representative of the U.S. Assistance Secretaries for Defense in charge of international security and financial affairs, agreement may be reached along rather different lines.

The original American proposal was that, of an initial expenditure of £10.5m, America would contribute £6m for airframe manufacture, the Japanese paying the remainder. This was to finance the assembly of 70 aircraft from American-made parts extending over two years from mid-1955. From 1957 it was originally intended that the Japanese should finance Sabre production entirely from their own funds, but Mr. Roth is reported as having indicated that American financial help might continue after this date. As now scheduled, Japan will assemble 70 F-86Fs before June 1957, 111 between July 1957 and June 1958, 214 between 1958 and 1959, and 200 between 1959 and 1961. The grand total is thus 595 Sabres, all of which are scheduled for the A.S.D.F. The estimated Japanese share of the cost of this programme is £40-£50m.

Mitsubishi also imported a T-28 from North American Aviation, in the hope that the type would be adopted by the A.S.D.F. as a piston-engined advanced trainer. This, however, seems very unlikely in view of the standardization of the T-34/T-33 training sequence.

Mitsubishi's only post-war design so far is the projected JTM-1 advanced trainer. This design, which has been submitted for consideration by the National Defence Agency as a standard basic trainer, has a swept wing, and the prototype would be powered by an American-built Continental Marboré turbojet. Production versions would have a 2,200 lb thrust turbojet of Japanese design—probably the JO-1 described below.

A close liaison has also been established with the Sikorsky Division of the United Aircraft Corporation, with a view to the manufacture by Mitsubishi of advanced types of helicopter. The Japanese company have already assembled American-made components for 12 HO4S (S-55) helicopters for the Maritime Safety Board; these helicopters are now being used by the Naval Self Defence Force, for whom Mitsubishi carry out maintenance and overhaul. Mitsubishi also manufacture S-55 spares.

Okamura Manufacturing Company, Ltd. During World War 2, the predecessors of this company built light liaison, observation and training aircraft for the Japanese Navy. Today, the manufacture of light aircraft is being carried out on a small scale. The N-52 side-by-side two-seater was designed by Prof. H. Kimura of Nihon University, and the prototype flew in the summer of 1953. It is a neat little aircraft with a mixed structure of wood, steel tube and fabric. As far as is known, only one has so far been made.

During the past 18 months the Okamura company have also completed the design of a two-seat sailplane for the University of Tokyo. The construction of several has begun and at least one should be flying this year.

Showa Aircraft Industries Company, Ltd. This Tokyo firm were the first to return to aviation when, early in 1952, they secured an overhaul and repair contract from the American F.E.A.F. One of the principal types involved in this contract was the Douglas C-47 transport, and it is of historical interest that the DC-3 was

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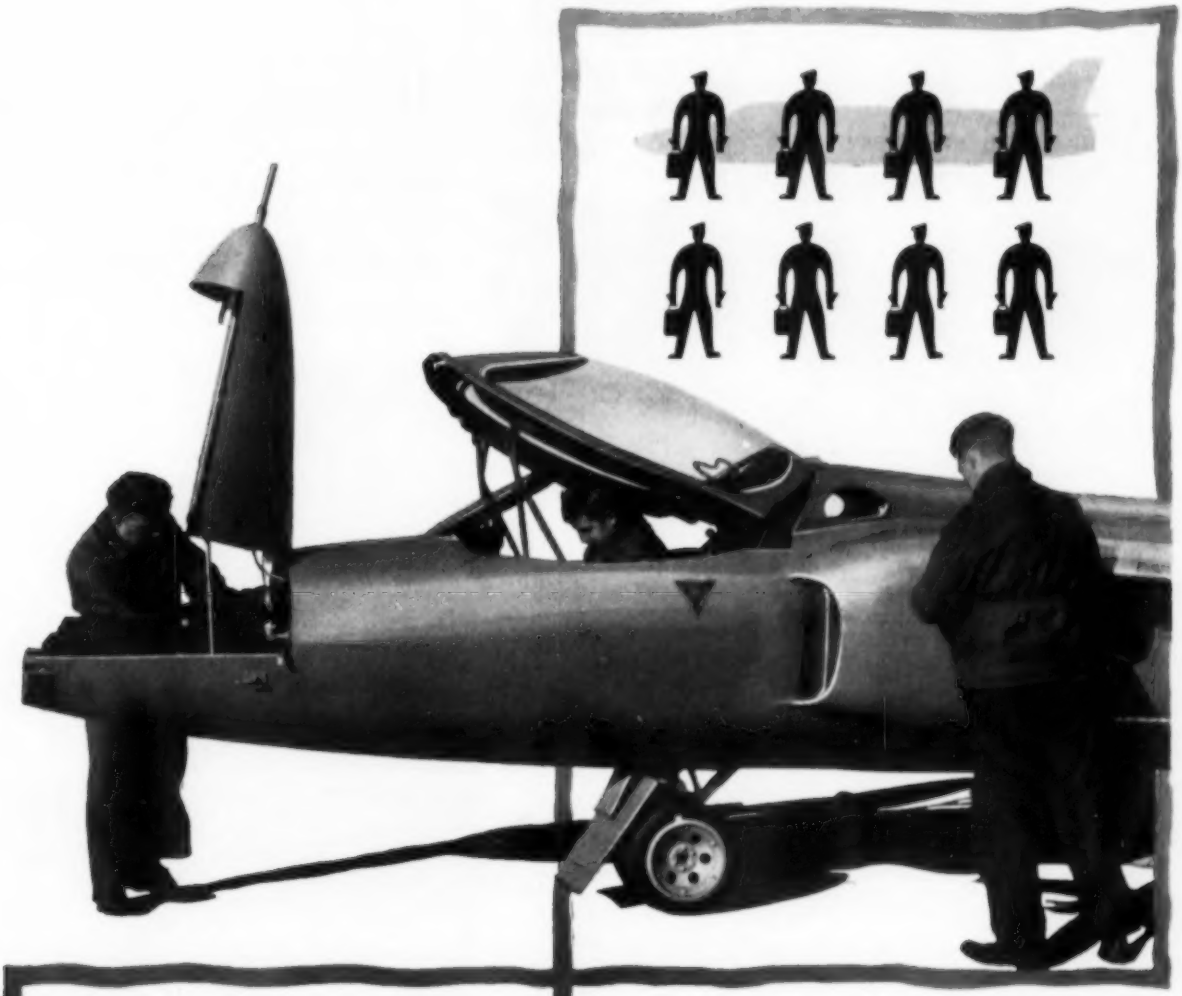

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RE-RISING SUN . . .

licence-built by Showa before and during World War 2. Showa plan to manufacture complete aircraft, but no prototype design or licence agreement has yet been made public.

New Tachikawa Aircraft Company, Ltd. This firm remained more or less intact during the "forbidden" period and they erected a fine new factory outside Sunagawa, replacing their own original plant which is occupied by the U.S.A.F. During the summer of 1952 the company completed the design of their Tachihi R-52 trainer, and the prototype was completed in September of that year. This was the first post-war aircraft built in Japan and it was, into the bargain, constructed entirely of Japanese materials and powered by a Japanese engine (a 130 h.p. Jimpu Radial).

From the R-52 has been developed the Cirrus-powered Tachihi R-53, of generally similar layout. The company have also built at least one example of a refined cabin version of Henri Mignet's *Pou du Ciel* (Flying Flea). This machine, designated Tachikawa R-HM, has done considerable flying but is not in production.

Toyo Aircraft Manufacturing Company, Ltd. Unique among the important Japanese aircraft firms in that it did not exist before VJ-Day, the Toyo company was formed in the summer of 1952 by a former aircraft executive, a former admiral and a former minister. The first-named, Yoshio Hashiguchi, was formerly managing director and chief engineer of Kawasaki.

The company were early off the mark with their TT-10 tandem trainer, powered with a Lycoming flat four. The prototype flew at the end of 1952 and a small batch is since reported to have been completed. Construction is generally of wood, with the exception of the steel-tube fuselage, the covering being of fabric. Toyo's principal effort, however, is being undertaken in conjunction with the Fletcher Aviation Corporation of California. In 1953, Toyo secured manufacturing rights for the FD-25A Defender, and this machine is now in full production. A number have already been completed for the Air Self Defence Force, and Toyo also hope to attract a wide market for the Defender in such countries as Thailand and Indonesia.

Engine Production. Although Japan produced several remarkably good engines during World War 2—particularly air-cooled units of the 2,000 h.p. class—she has so far made little headway in re-establishing production lines of competitive power units. Several factors, particularly the introduction of the gas turbine, have wrought great changes in the skills, tools and processes required; even with "Western" assistance, the mass-production of modern engines is probably still at least two years distant.

Fuji Heavy Industries. Back in 1952, the Omiya Fuji Co. received a grant from the Japanese government of £3,500 to assist the development of a small axial turbojet (British engine companies will no doubt smile at the magnitude of this sum). This engine, designated Fuji JO-1, is a forward development of the NE-20 turbojet of 1944-5 which was, in turn, a variant of the original German B.M.W. 109-003, examples of which were shipped to Japan in a U-boat.

The JO-1 is a simple single-shaft engine, with an eight-stage compressor (ratio, about 4 : 1), eight separate combustion chambers and a single-stage turbine. Equipped, the JO-1 weighs about 990 lb and the design thrust is 2,200 lb at 12,000 r.p.m., with a specific fuel consumption of 1.1 lb/hr/lb. The prototype JO-1 was assembled in the summer of last year. We illustrated it in our issue of September 3rd, and commented that it was then scheduled to run "in a few weeks," but no report of its behaviour on test have yet been received. The Omiya Fuji company were absorbed into Fuji Heavy Industries in July 1953, and the Fuji group are now working under contract to the Japan Jet Engine Company.

Last year, Fuji paid just over £80,000 for a licence to manufacture Continental engines (this licence is thought to exclude Continental-Turboméca engines) and market them throughout eastern Asia. Flat-six Continental units are now coming into production for the Fuji-Beech Mentor and the Toyo-Fletcher FD-25A.

Ishikawajima Heavy Industries. Well known for their aircraft in World War 2, this company have had a small staff at work upon the development of ramjets for the past two years. A number of simple subsonic ramjets have been tested on whirling rigs, and these units bear great similarity to those developed in California by Hiller Helicopters, although there is no report of any liaison between the two companies.

During 1954, Ishikawajima were hoping to receive part of the second distribution of Mutual Security Agency funds in order to establish themselves as the manufacturer of the General Electric J47 turbojet to meet the requirements of Japanese Sabre production. However, the Ministry of International Trade and Finance reiterated their policy that there should be only one organization (the Japan Jet Engine Company) responsible for the production of gas-turbine aero engines. Ishikawajima were one of the founder-firms of the private Japanese Jet Engine Manufacturing Company.

Japanese Jet Engine Manufacturing Company. During 1953, Fuji Heavy Industries, Fuji Precision Industries, Ishikawajima Heavy Industries and Mitsubishi Heavy Industries jointly formed an organization with this title, the starting capital being £160,000. The terms of reference of the combine were, first, to catch up on gas-turbine developments during the period 1945-53, and, second, to produce gas-turbine aero engines of either native or imported design. It was suggested that, once production began, the organization should be disbanded.

Plans have been laid for co-operating with other Japanese organizations working towards similar goals. On the other hand, it is by no means certain that any liaison is maintained with the organization listed immediately below.

Japan Jet Engine Company. This entirely new organization was planned last year by the Ministry of International Trade and Industry. It is a semi-official enterprise, with both government and industrial backing. On August 17th, 1954, I.T.I. Ministry officials deliberated upon the Japanese engine-production policy, as a result of which the decision—far-reaching, and possibly short-sighted—was taken that the J.J.E. Co. should be reorganized as a special company which should then become the sole Japanese manufacturer of gas turbine aero engines. The early development of the company was to be assisted by the allocation of part of the M.S.A. wheat grant.

This decision has by no means been accepted without question by Japanese industrial firms, who have shown themselves suspicious of government-backed organizations. The National Defense Agency are also quoted as entertaining hopes of the establishment of at least two private companies as jet manufacturers. The Finance Ministry, however, has proclaimed itself opposed to widespread domestic manufacture of gas turbines, on the grounds that it is cheaper, and far quicker, to import such units as are required. While this may be true it is doubtful if such a policy will benefit Japan in the long run.

At present the J.J.E. Co. remain a "chosen instrument," and it is scheduled to operate as a monopoly. Its principal task seems to be the licence-production of the General Electric J47 turbojet, at least 1,000 of which will be needed by the Japanese Sabre programme between now and the summer of 1961. There are indications, however, that at least the first few hundred J47s will have to be imported.

Kawasaki Aircraft Company. It is intended that Kawasaki-Kikai shall be the sole source of engines needed by all Kawasaki-built aircraft. A considerable production capacity is already in existence for piston engines up to almost 1,000 h.p.

Kawasaki have already designed and built an engine, with the designation KAE-1. This unit, the first to be produced in Japan since the war, is a six-cylinder, air-cooled, horizontally opposed engine giving 240 h.p. No doubt it bears a close resemblance to the Lycoming engines with which Kawasaki have become familiar. The prototype KAE was run at the Kobe works last September. Production units are to be fitted to all Kawasaki-Bell helicopters and to a number of types of fixed-wing aircraft.

Supported by Lockheed Aircraft Service (Overseas), Inc., Kawasaki have also entered the turbine field. Within three months the Japanese company took over a bombed-out installation and built, equipped and staffed a complete engine-overhaul plant, which started work at the beginning of this year. The new factory is engaged in the repair and overhaul of Allison J33 turbojets from Lockheed T-33s and F-80s based in Japan and Korea. Kawasaki also—naturally enough—have expressed a desire to build the J33 to meet the needs of their own programme for making T-33s, but the Japanese government is not at present allowing any company to manufacture both aircraft and engines. The J33s will, therefore, be imported, unless their manufacture can be undertaken by the Japan Jet Engine Company.

Shin Meiwa. The de Havilland Enterprise is assisting this aircraft company to establish itself as an overhaul organization for Gipsy engines, a number of which are now operated in Japan, principally in Herons and Doves.

NON-DESTRUCTIVE INSPECTION

THE recently formed organization bearing the somewhat startling title of The Society of Non-Destructive Examination appears to be making progress. As engineers will at once recognize, its members' interests lie in the field of inspecting metallic and other materials by methods—X-ray, magnetic, and so on—which do not involve damage to the work under examination.

The next quarterly meeting of S.O.N.D.E. takes place on April 22nd, when the guest speaker will be Mr. E. W. Colbeck, M.A., F.I.M., metallurgical and research director of Hadfields, Ltd., who will be talking on the application of non-destructive examination methods to heavy castings and forgings.

Although the headquarters of the Society are in London—at Duncan House, Dolphin Square, S.W.1.—the policy is to hold a number of meetings in various industrial centres, and accordingly the summer meeting will be held in Manchester, on July 15th. The hon. secretary of S.O.N.D.E. is Mr. C. C. Bates.

General view of the new S.A.T.C.C. at London Airport, looking past the height - finder scanner towards the main operations-room block and a long-range scanner.

SOUTHERN AIR TRAFFIC CONTROL

AS briefly reported last week, the new Southern Air Traffic Control Centre at London Airport is about to begin operation. The photographs and diagram on this page provide further information on the unit, which comprises a self-contained air traffic control centre including its own radar installation.

This is the largest and busiest of this country's three main A.T.C. centres, the other two being located at Prestwick (Scottish Area) and Preston (Northern England, North Wales and Northern Ireland). In order to handle the large number of aircraft, the airways and advisory routes controlled by the southern centre are divided into the following sectors:

Sector 1: Traffic east of London on airways Green One and Red One (to and from Brussels, Amsterdam, Scandinavia); and traffic south-east of London on airway Amber Two (from Paris and Rome).

Sectors 2 and 3: Inbound traffic in the vicinity of the London Control Zone (either bound for aerodromes in the zone or overflying the zone to, say, Manchester).

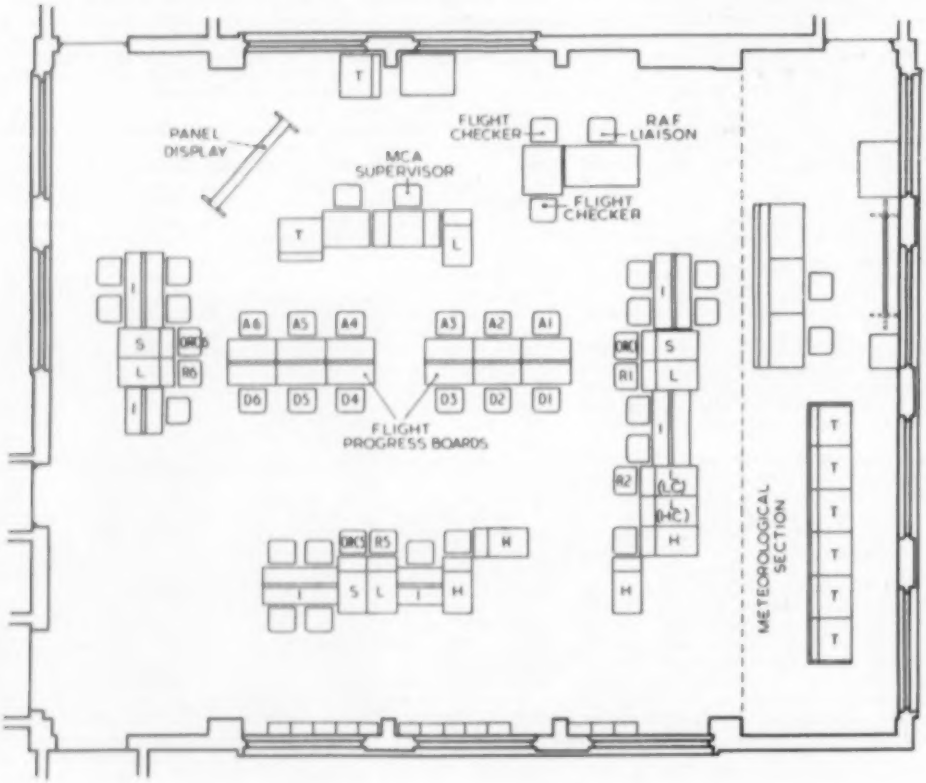
Sector 4: Outbound traffic from aerodromes in the London Central Zone.

Sector 5: Traffic on airways Amber One south of London (to Paris and Rome) and Red One west of London (to Channel Islands, Spain, Portugal, Western France).

Sector 6: Traffic on airways Green One west of London (transatlantic services *via* Shannon), Amber One and Amber Two north of London (to Dublin, Belfast, Prestwick, Manchester and Birmingham).

Each sector has its own "executive" (or "D" controller) and his assistant (or "A" controller), both of whose radio-telephone equipment for communication with aircraft is capable of covering the whole of the routes, by means of remote transmitting and receiving stations.

As illustrated in the diagram, the "procedural" controllers



Main advantage of the new Southern Air Traffic Control Centre over its predecessor at Uxbridge is that procedural controllers and radar controllers work together in the same operations room, the layout of which is shown here.

I — Information display
L — Long-range radar
S — Short-range radar
L.C. — Low cover
H.C. — High cover
H — Height-finder
T — Teleprinter

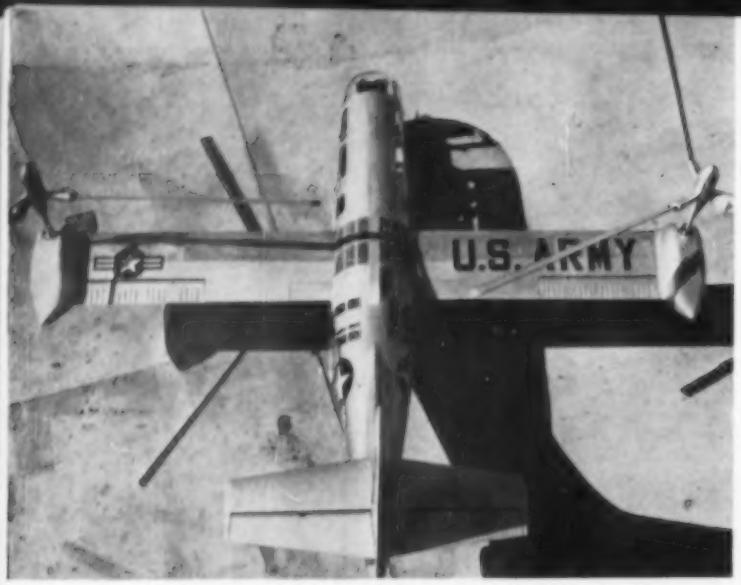
The Marconi Type S13 height-finder, used at the new centre. Transmitting and receiving equipment is housed immediately behind the scanner, on the vehicle.

covering sectors 1, 2, 5 and 6 each have their own radar controllers, who keep watch on aircraft flying within each respective sector. The Sector 4 controller who deals with aircraft leaving the London area has three short-range radar controllers to assist him; their task is to control aircraft immediately after take-off and subsequently to hand them over to the next sector.

The main types of radar equipment are long-range surveillance, short-range (zone control), and height-finding. Up to the present, several different types of equipment have been used in piecemeal fashion but, in the design of the new centre, a planned installation with up-to-date technical features has provided a fully integrated system. Two AN/CPS—1 MEW (microwave early warning) sets of American origin form the long-range installation; Marconi S232 50-cm zone surveillance radar (with the facility of erasing permanent echoes from the P.P.I. display) is used for short-range coverage up to 70 nautical miles; and one Marconi Type S13 10-cm set provides height-finding up to about 100 nautical miles; two further height-finders are to be installed.

A new type of radar display console has been designed, containing the minimum of electronic equipment. Its flexibility is indicated by the fact that it can be plugged in to any one of the three main radar installations—long-range, short-range, or height-finder—so that an aircraft can be tracked continuously from 130 miles out and its height determined. Each console, about the size of a table television set, is connected by a single 16-core cable through the floor, *via* the rack-mounted data generating equipment below, to the scanners and radar heads outside.

Top, procedural controllers at the flight progress boards; centre, radar controllers and information-display assistants; right, the communicators' room where company and other messages are passed on by teleprinter. Below, the scanner of the Cossor airfield control radar (left), and the scanner of one of the long-range MEW sets.



Though showing the Bell XV-3 convertiplane in something approaching plan view, the picture above—by virtue of the cast shadow—also illustrates features of the side elevation. On the right is a de Havilland Canada Otter, one of the first of 90 being supplied to the U.S. Army under the designation U-1. This particular aircraft is painted in Arctic colours, i.e., with red wing tips and tail, for identication against snow.

AIRCRAFT INTELLIGENCE

Great Britain

Vickers-Armstrongs Valiant. If serial numbers are any guide, at least a dozen Vickers Valiant B.1 bombers have already been completed. These aircraft are flown "light" out of Brooklands to the maker's main airfield at Wisley.

U.S.A.

Boeing B-52. It is officially announced by the U.S.A.F. that the sole armament of the Boeing B-52 eight-jet bomber is four 0.5in guns (not 20 mm guns, as has been stated). These are mounted in a barbette in the extreme tail and, although having provision for automatic ranging and firing, are "monitored" by a gunner seated in a self-contained compartment immediately behind the rudder. The entire installation is appropriately described by Arma—which company is primarily responsible—as a "defence system."

Sikorsky Transport Helicopter. A design-study has been made by Sikorsky for a 50-passenger civil-transport helicopter, powered with two turboprops, carrying a payload of 11,000 lb and having a gross weight of 33,950 lb. Cruising speed is estimated to be 160 m.p.h. and range 185 miles. A drawing shows the machine to resemble the S-56 in general layout but to have a longer fuselage; a "conservatory" nose, with the pilots' cockpit above; and wheels retracting into fairings beneath the nacelles. There are two tail rotors, set one on each end of the high-set tailplane. The single main rotor has five blades.

Ryan V.T.O. Fighter. Possibly designated XF-109, but known also by the maker's type number 69, a vertical take-off fighter, now under construction by the Ryan Aeronautical Co., will be powered by a single Rolls-Royce Avon RA.28 of 10,000 lb thrust. The Avon was selected because of its high thrust/weight ratio. Gross weight should be about 8,000 lb.

France

S.N.C.A.S.E. Alouette II. This new five-seater helicopter (illustrated on this page last week) made its first flight on March 12th at Buc, with, it is said, entirely satisfactory results. A production version of the Alouette I, it is powered by a Turboméca Artouste II gas turbine of 360 h.p., driving a single rotor. All-up weight is 2,980 lb and estimated performance figures are: ceiling 14,760ft, rate of climb 1,970ft/min, cruising speed 106 m.p.h., range 323 miles. The first five Alouette IIs of a production order from the French Government are due for delivery between October and December this year.

Dassault Super Mystère. After fifteen hours' test-flying by the manufacturers, this notable French intercepter—a new view of which appears on this page—should now have been handed over to the French Flight Test Centre. While awaiting official confirmation of a production order, Dassault have been making provision for building the type in series for the French Air Force. The version concerned will probably be the IVB2, powered with a S.N.E.C.M.A. Atar 101G turbojet with afterburner. The possibility nevertheless exists that the order will also entail production of the IVB1, fitted with a Hispano-Suiza-built Rolls-Royce Avon, likewise having an afterburner.

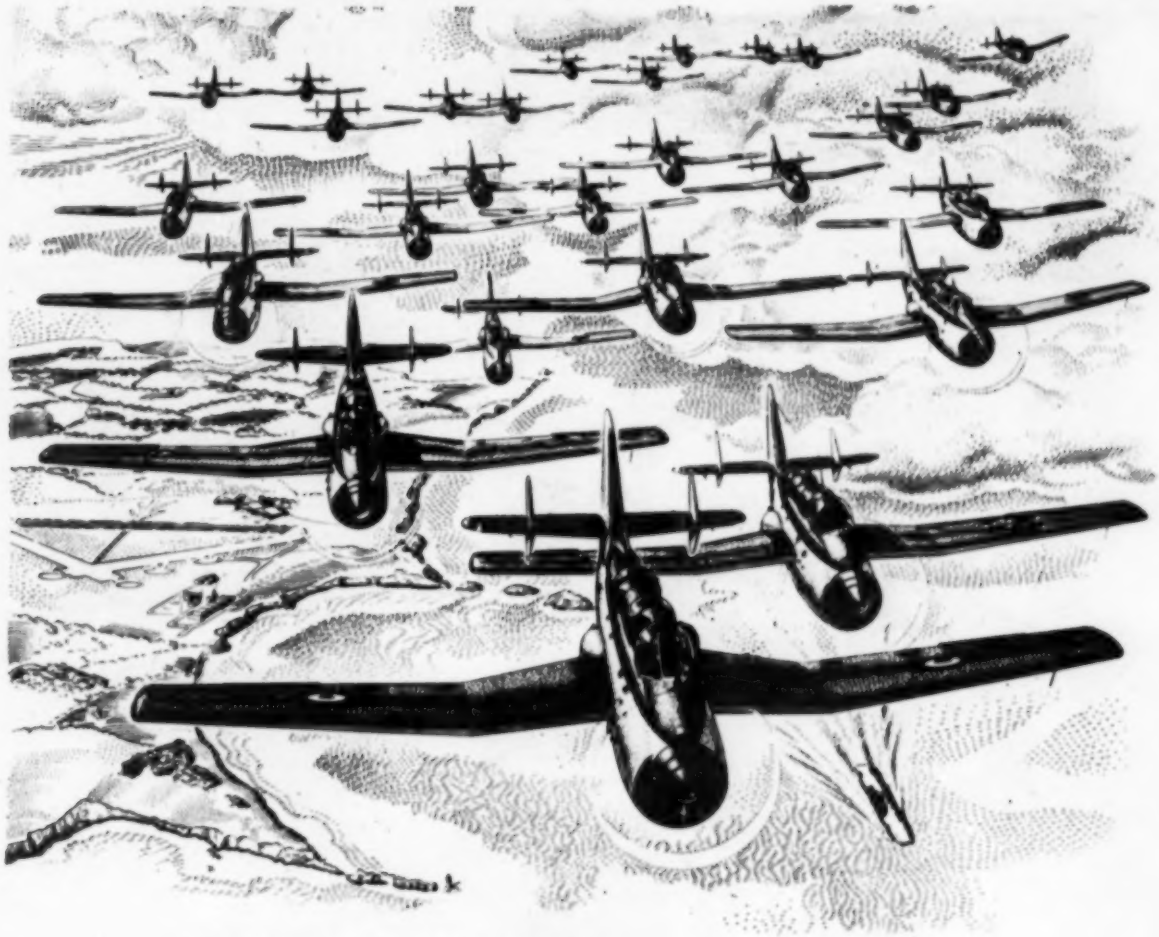
A.C.13 Helicopter. Under the designation A.C.13, but also known by the type number N.1750, a new helicopter is being built by the French S.N.C.A.N. concern under licence from Aerotechnica Cantinieau, of Spain. Though equipped with a Turboméca Artouste I, of 280 h.p., it employs less than 200 h.p. "owing to the diameter of the rotor." The jet-pipe is articulated and by means of a pedal control the jet is used to compensate torque and give directional control. Numerous test flights have been made since January. Single-seat and three-seat versions are planned, the former having a gross weight of 1,540 lb and the latter weighing 1,900 lb. Maximum speed is 93 m.p.h. and hovering ceiling 14,000ft.

Spain

HA-200 (XE-14). Designed by Willy Messerschmitt for La Hispano Aviación S.A., of Seville, the HA-200 (military designation XE-14) is a tandem two-seater powered with two Turboméca Marboré turbojets in the lower fuselage. A nose intake, wing-tip tanks and a single fin and rudder are features. Span is 34.16ft, weight empty 3,196 lb, gross weight 7,050 lb, maximum speed 440 m.p.h., service ceiling 29,500ft, and range 1,050 miles.

In common with the North American Super Sabre, France's Marcel Dassault Super Mystère (otherwise known as Mystère IVB1) has a "flattened" intake.

No doubt about the GANNET



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[ARMSTRONG SIDDELEY "DOUBLE MAMBA" TURBO-PROP ENGINE]

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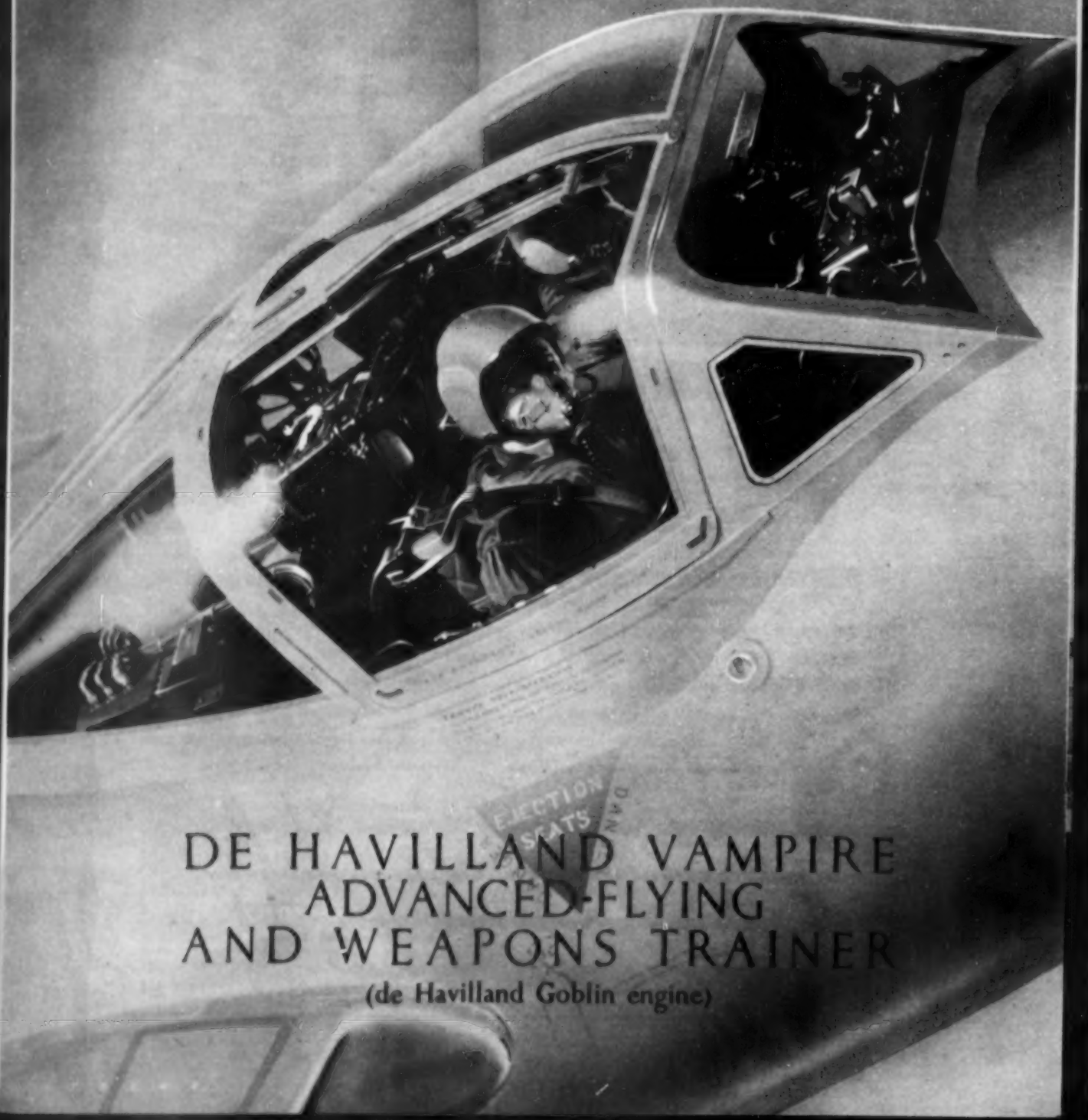
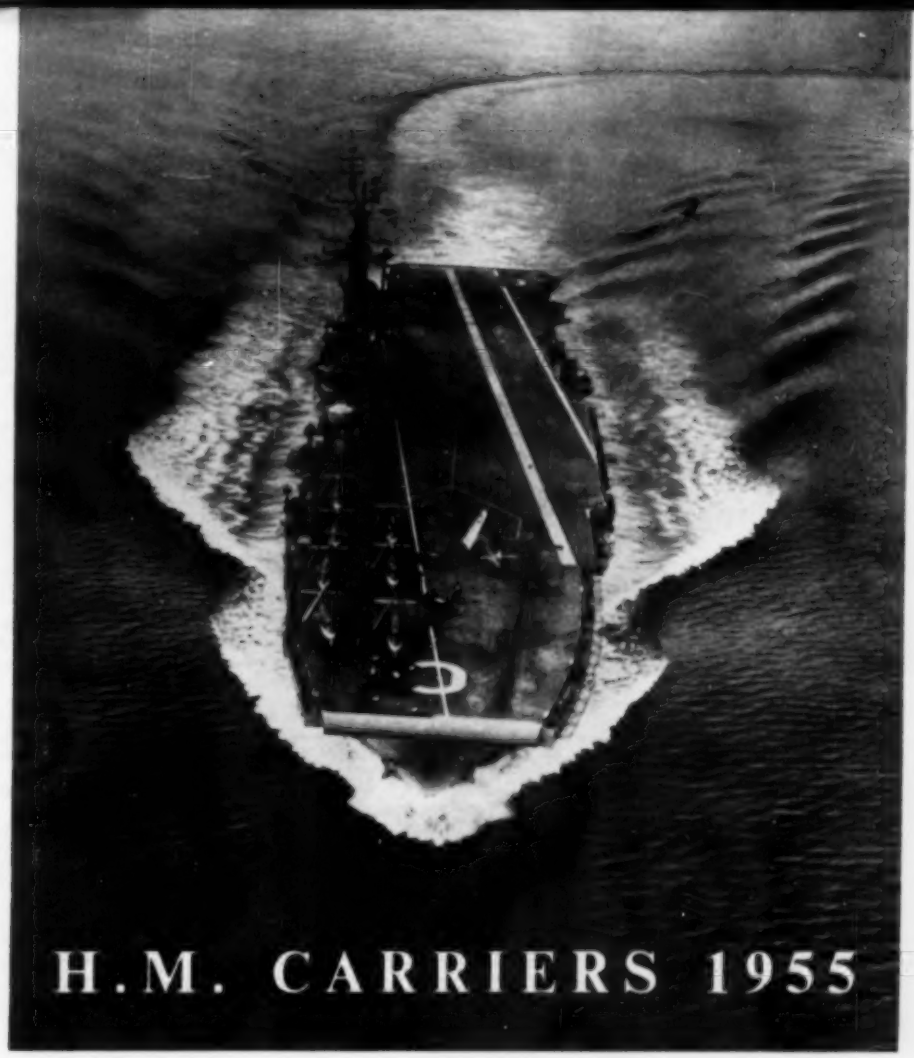


DE HAVILLAND VAMPIRE
ADVANCED-FLYING
AND WEAPONS TRAINER

(de Havilland Goblin engine)



H.M. CARRIERS 1955

THIS year of "defence by deterrence" is an appropriate time to survey the rôle of the aircraft carrier in a thermo-nuclear age, and also to review the carrier strength of British and Commonwealth navies. Despite the pronouncements of certain critics who see in the large carrier a costly and vulnerable mistake, there are sound reasons not only for maintaining this country's present carrier force but also for increasing it markedly. While the rapid development of aircraft led to the decline of the battleship and the rise of the aircraft carrier (to replace it in significance though not in function), another set of special conditions has now been imposed by the development of thermo-nuclear weapons. In this introduction, the case for the carrier is summarized and interpreted in the light of present-day facts; on the following pages appears an illustrated review of those carriers in active and reserve service with the R.N., R.A.N. and R.C.N., and a description of some of the modern equipment which has kept carrier technique abreast of current aircraft development.

If one accepts the unpleasant yet realistic task of forecasting the nature of possible future "hot wars," three main concepts appear. The first is that of all-out, global, thermo-nuclear warfare, defence against which is the first-priority "deterrence"

"Flight" photograph

H.M. CARRIERS 1955 . . .

"Flight" photograph

described in the recent Defence White Paper. The ability to attack is stated (logically yet unpalatably) to be the most effective defence against the outbreak of such a war.

The Navy's main contribution here lies in the *mobility* of its carrier force. Airfields used by the retaliatory bombing force can presumably be located and pin-pointed in advance by the prospective enemy. These would be major targets (for either manned bombers or the more deadly ballistic rockets with atomic warheads). There have recently been immense strides in the types of aircraft which can operate from carriers, and it is true to say that, from now on, the Navy will have aircraft capable of carrying nuclear weapons. Few would deny the value of mobile air bases able to retaliate against the enemy from unexpected directions through weak points in the defences.

It is not at present Admiralty policy to take part in retaliatory bombing in the strategic rôle; but, with modern NATO carrier task-forces used in a realistic way, their relative invulnerability makes this a function which certainly *could* be —and, in the opinion of the modern school of naval thought, *should* be—accepted.

A second possibility is that of a global war without the use of nuclear weapons, due to fear of retaliation on both sides. Alternatively, there might be a condition of "conventional war," or war with only limited use of nuclear weapons, during a period of stalemate following initial H-bomb attacks. In these circumstances, the aircraft carrier's value would lie in its more traditional rôle of protecting lines of communication, especially between the U.S.A. and the U.K. There is here no alternative. The *only* form of effective defence against enemy cruisers or land-based aircraft consists in long-range carrier-based strike aircraft, operating in strategic areas.

Concerning localized warfare, the third type which might be considered, the records of carriers in action during the Korean war (although admittedly mainly against weak opposition) give a further indication of their value. Carriers can transport to any area of the globe what is in effect a self-contained air force, independent of runways and ground supplies, and can give immediate, close and effective support to Army and other units.

In consideration of any global war, the Royal Navy must obviously be viewed as a part of the NATO Navy, and its carriers as units in NATO carrier groups. Only in isolated instances (such as the Korean war) can carriers operate effectively alone: in general, it is the carrier task-force—including radar pickets and cruiser and destroyer support, as well as both large fleet carriers and smaller carriers —that is the fighting unit. Generally, too, the group's carriers would number at least four; otherwise too much air effort would be spent on self-defence. The ideal composition of a carrier task-force, however, is variable, depending on the strength of the opposition and the anticipated results. With the introduction of vessels carrying ship-to-air defensive missiles (which vessels will doubtless take over many of the functions of the small fighter-equipped carrier, located on the perimeter of the carrier group) integration of both missile ships and defensive carriers will be the next step.

One reason, apart from mobility, why a carrier's defence against air attack can be more effective than that of a land base, is that its radar warning stations can be placed in the most strategic positions (and can be changed at will). The combination of this and the presence of the carrier's own fighters provides an extremely powerful defence—a point often ignored by critics of the carrier on this score.

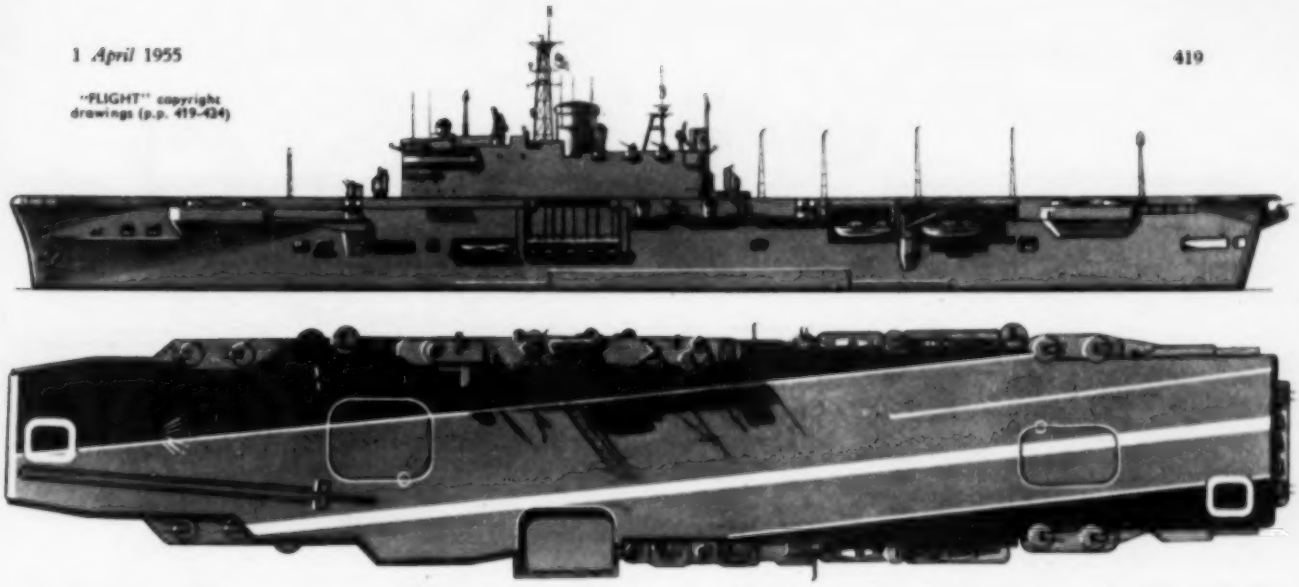
It has been said that the "unconventional" Navy of a few years' time may well have as its outline a floating counterpart to Bomber Command. If the Navy can, in fact, strike as far and as hard into enemy territory as can Bomber Command —a question whose answer depends on the performance of the next generation of strike aircraft—then the carriers can exploit routes which take their aircraft over the least defended territories. This is the plan, it is suggested, that lies behind the new investment in high-powered fighters and missile ships, for both will still be needed to defend the attacking carriers.

Whatever future advantage may or may not be taken of the Fleet Air Arm's ability to mount an atomic attack, one fact, at least, is undisputed. The securing of this country's communications has always been the Navy's job—a job performed more powerfully and efficiently with present-day carriers and ship-borne aircraft than ever before.

"Flight" photograph

Coming in, down and around: the Sea Hawk, day fighter, R.N.

"FLIGHT" copyright drawings (p.p. 419-424)



H.M.S. ARK ROYAL ***Displacement*** 46,000 tons ***Length*** 808ft 3in ***Beam*** 112ft 9in ***Complement*** Over 2,000 ***Aircraft capacity*** 80-100

ARK ROYAL

THE LATEST fleet aircraft carrier to be completed in the United Kingdom, H.M.S. *Ark Royal* was accepted by the Navy on February 25th of this year. She is the eighth British carrier to be completed since World War 2 and is one of the two largest ever commissioned by the Navy.

Following the sinking of the first fleet aircraft carrier *Ark Royal* in November 1941, the name was given to a considerably bigger carrier project previously known as *Irresistible*. The new *Ark* was laid down in May 1942, and launched seven years later, and began contractors' sea trials in June 1954. The ship is now working up and is due to embark aircraft—her capacity is from 80 to 100, according to size and type—in the near future.

An impressive selection of modern equipment and design features is provided in the ship, her completion having been delayed to provide them. *Ark Royal* is the first British carrier to possess both the steam catapult (two are fitted) and the deck-edge lift. The flight deck incorporates the 5½-degree "interim" angle, and other features are the use of the "optical deck-landing device," i.e., mirror landing sight, on both port and starboard sides, and improved ventilation equipment in the aircraft hangars.

Steam catapults will appear operationally for the first time in *Ark Royal*, and the ship is fitted with a more robust type of arresting gear, enabling the landing as well as the take-off of large modern aircraft to be accommodated. The use of the angled deck has reduced the number of arrester wires required to six.

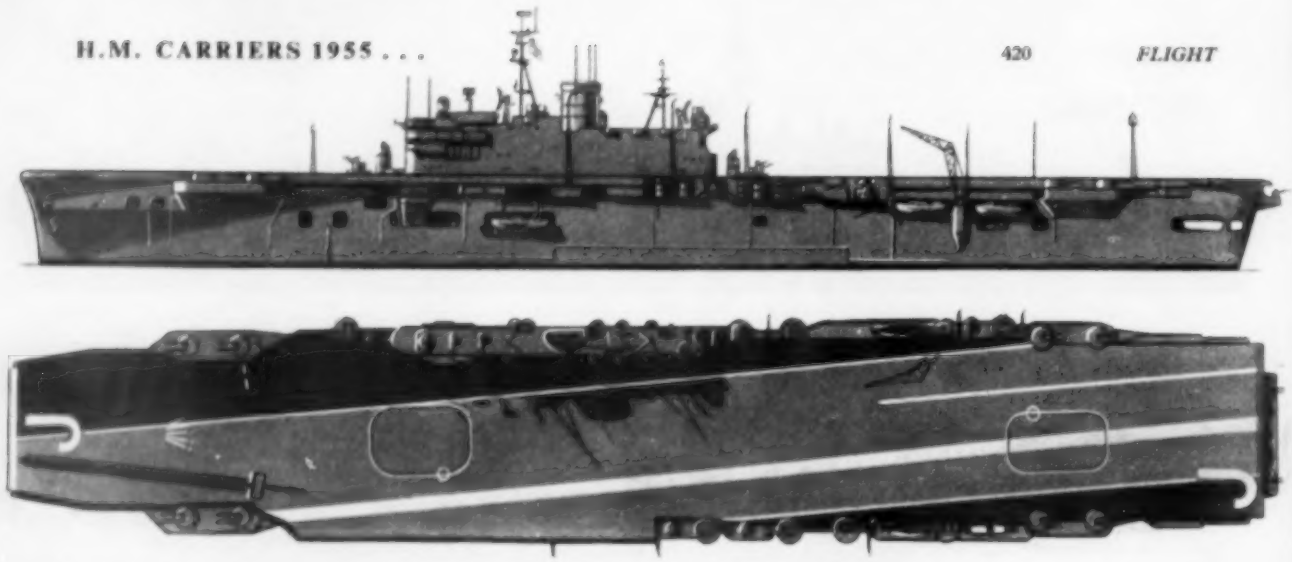
The deck-edge lift—the first to be installed in a British carrier—is situated amidships on the port side and serves the upper hangar, and there are in addition the two mid-deck lifts. This arrangement will contribute in a major way to the flexibility of flight-deck work, and must speed up flying operations considerably.

Aircraft fuel is stored in several groups of tanks dispersed throughout the ship in such a manner as to reduce to a minimum the risk of fire. Magazines for storing all types of airborne weapons are located in other protected parts of the ship, from which items such as heavy bombs can be raised by a special lift.

On the occasion of the *Ark's* recent commissioning, the ship's commanding officer spoke on her preparedness for atomic attack. He said: "It is well known that a ship, building or airfield suffering a direct hit from an atomic or hydrogen bomb will be destroyed. It is also well known that there is a 'near miss' effect for any bomb, whether it be H.E. or nuclear. It is also known that on the perimeter of a nuclear explosion there is the problem of radiation and of particles of vapour or dust which are contaminated.

"The engines of a ship require large quantities of air to keep them running, hence there is the possibility that contaminated particles of air or vapour may be drawn into the machinery. To enable this ship to steam in such circumstances, the machinery is fitted with remote control which would enable her to steam for a limited, but adequate, period, so giving her the ability to get away from the trouble. When the remote control is in operation there will be no hands in the machinery spaces. The machinery will be controlled from one of the many air-conditioned compartments."

Ark Royal



H.M.S. EAGLE *Displacement* 46,000 tons *Length* 803ft 9in *Beam* 112ft 9in *Complement* 2,750 (maximum) *Aircraft Capacity* 80-110

EAGLE

SISTER-SHIP to *Ark Royal*, *Eagle* was laid down as *Audacious* in October 1942. After the first aircraft carrier *Eagle* was lost in August 1942 the name was given to a carrier of the above class which was, however, subsequently cancelled at the end of the war. The sister-ship which had been begun as the *Audacious* was re-named *Eagle* in January in 1946 and was commissioned in October 1951. Her total cost was some sixteen million pounds.

Following a short working-up period, *Eagle* joined the Home Fleet, and took part in the NATO exercises Mainbrace and Mariner in 1952 and 1953 respectively. In mid-1954 the ship was taken out of service for a refit, including the fitting of an interim angled deck and mirror landing sights, and was recommissioned only last month.

Two more large fleet carriers of this type, *Africa* and the original *Eagle*, were cancelled at the end of World War 2, and three even larger fleet carriers, to have been named *Gibraltar*, *Malta* and *New Zealand*, were also cancelled.

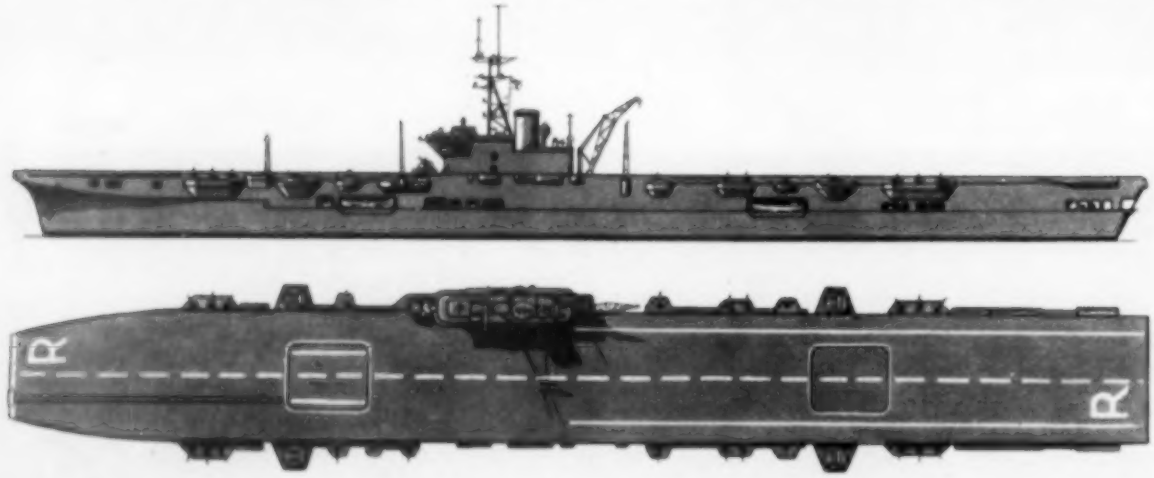
"COLOSSUS" CLASS

ILLUSTRATED BELOW is H.M.S. *Glory*, which has been employed as a trooping and ferry carrier since last summer. Of her four sister-ships, *Ocean* and *Theseus* were fitted out for service in the Training Squadron at about the same time; *Triumph* was modified in 1953 as an officer-cadet training ship; and *Warrior*, which underwent modifications in 1952-53, is being further modernized at present. It may be recalled that *Warrior* was experimentally fitted with a flexible landing deck in 1948-49 for trials with jet-powered aircraft equipped with skids.

Other light carriers which may be considered under this heading are *Colossus* (re-named *Arromanches* and sold to France in 1951), *Venerable* (re-named *Karel Doorman* and sold to the Netherlands in 1948), *Perseus* (ex-*Edgar*, completed as a maintenance carrier, used as a ferry carrier and now in Class 3 reserve), *Pioneer* (completed as a maintenance carrier, scrapped in 1954), and *Unicorn* (built as an aircraft supply and repair ship, served operationally during 1939-45 war, taken out of reserve in 1949 and refitted for further use as a maintenance and replenishment carrier, served operationally throughout Korean war, re-designated a ferry carrier in June 1953 and now in Class 3 reserve).

The light carriers *Leviathan* and *Hercules* were not completed. Work on both ships stopped in May 1946 when *Leviathan* was structurally almost complete and 80 per cent fitted out: *Hercules* was at that time not so far advanced. They are still laid up.

H.M.S. GLORY *Displacement* 18,040 tons *Length* 695ft *Beam* 80ft *Complement* 1,300 *Aircraft Capacity* 35



"HERMES" CLASS

ORIGINALLY EIGHT ships of this class were ordered. Of these, *Arrogant*, *Monmouth*, *Polyphemus* and the first *Hermes* were cancelled; *Albion*, *Bulwark* and *Centaur* are now with the fleet, and *Elephant*, re-named *Hermes*, is still under construction.

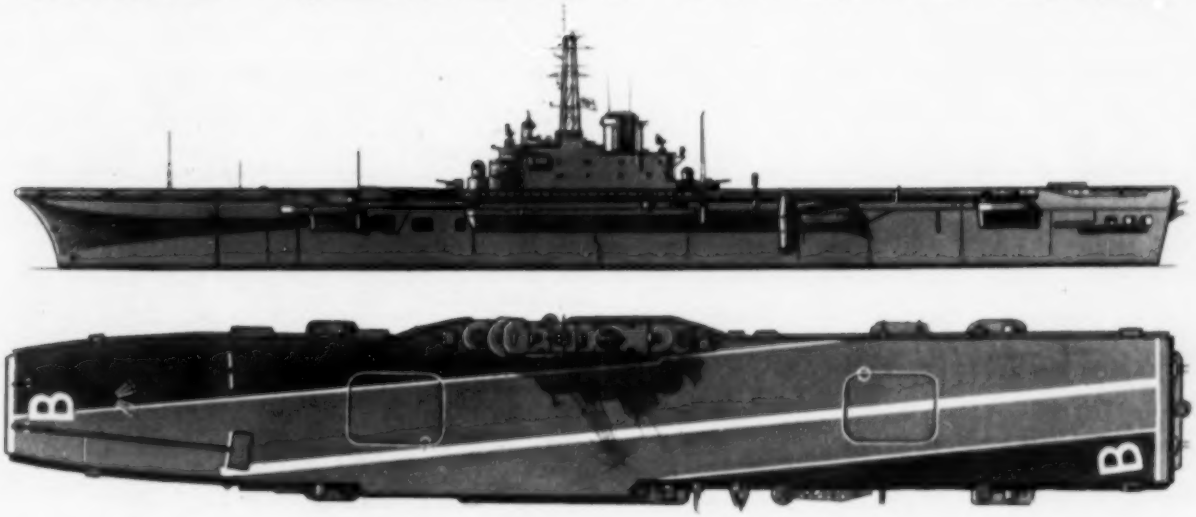
Albion, *Bulwark* and *Centaur* are virtually identical ships. *Albion* was laid down in March 1944 and commissioned in May 1954 and is now in the Mediterranean. *Centaur*, laid down in May 1944 and commissioned in September 1953 is also in the Mediterranean at present and, together with *Albion*, forms part of the Aircraft Carrier Squadron under Flag Officer Aircraft Carriers. *Bulwark*, which was laid down in May 1945 and commissioned in November 1954 was the third *Hermes*-class carrier to join the fleet, and has taken over from *Illustrious* the duties of trials and training carrier. *Centaur* is the subject of the heading picture of this review on page 417.

Work on each of the above three carriers was accelerated in 1950, when it was decided to incorporate an "interim" angled deck—of 5½ degrees—rather than accept the delay and additional expense involved in transferring to the fully angled variety. Improvements incorporated during the construction of these ships have resulted in an increase in the displacement figure from an originally designed 18,300 tons to the present 20,330 tons (standard) and 25,910 tons (full load).

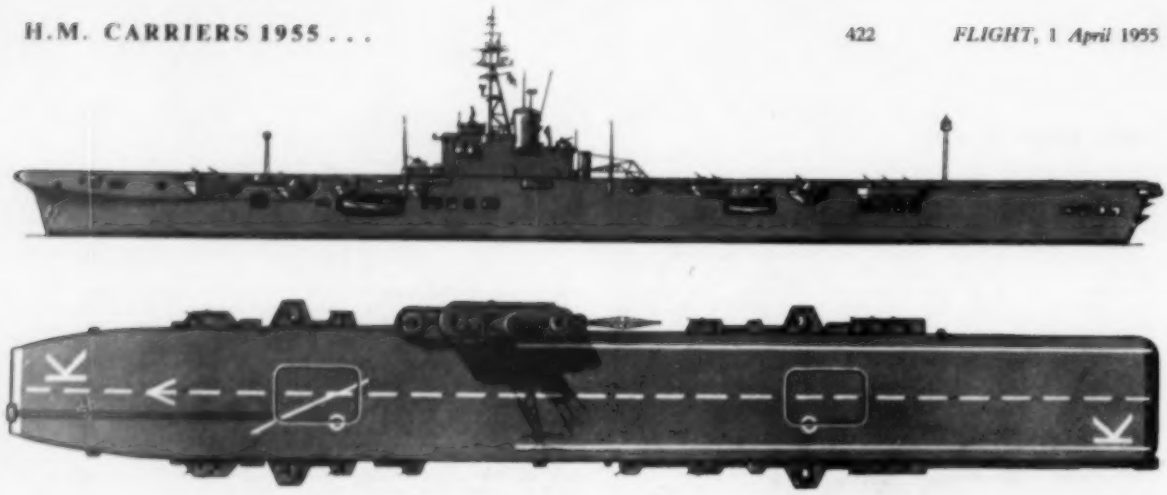
Last autumn *Albion* became the first carrier to be fitted with the optical landing aid in addition to an angled deck, and now carries the mirror sight on both port and starboard sides. First carrier "touch-and-go" landings by the Navy's D.H.110 also took place on *Albion*, the date being September 23rd last. The complements of *Albion* and of *Centaur* will be approximately 80 officers and 950 ratings, excluding squadron personnel, who will normally consist of 50-60 officers and 250-300 ratings.

Completion of the *Hermes* itself has been delayed by the decision to apply all the latest refinements in modern carrier design. In many ways she will be more advanced than the earlier ships of this class—so much so that the net result will be virtually a different type of ship. The full eight-degree angled deck will be incorporated, together with steam catapult, mirror landing-aid and deck-edge lift (fitted for the first time in this country on *Ark Royal*).

H.M.S. BULWARK ***Displacement*** 25,910 tons ***Length*** 737ft ***Beam*** 90ft ***Complement*** 1,350 ***Aircraft Capacity*** 45



Sea Venom, the Fleet Air Arm's all-weather fighter, lands on.



H.M.A.S. SYDNEY **Displacement** 19,550 tons **Length** 695ft **Beam** 80ft **Complement** 1,350 **Aircraft capacity** 34

ROYAL AUSTRALIAN NAVY

THERE ARE at present two light fleet carriers in service with the Royal Australian Navy, H.M.A.S. *Sydney* (operational) and H.M.A.S. *Vengeance* (training). *Sydney* (ex-*Terrible*) was completed and entered R.A.N. service in 1949, while *Vengeance* is on loan from the British Government until shortly before the arrival of *Melbourne* (ex-*Majestic*), which has been constructed in this country and is now undergoing contractors' trials. *Melbourne* is expected to commission in October of this year, and—fitted with a six-degree angled deck and steam catapult—will then become the R.A.N. operational carrier, the rôle of training carrier being taken over by *Sydney*.

The modification of *Sydney* to modern standards (including angled deck and steam catapult) will probably be carried out after the arrival of *Melbourne* in Australia. During 1955 two R.A.N. anti-submarine squadrons will be re-equipped with Gannets and a fighter squadron with Sea Venom 53s. The present strength of Australia's Navy is five front-line and two second-line squadrons.

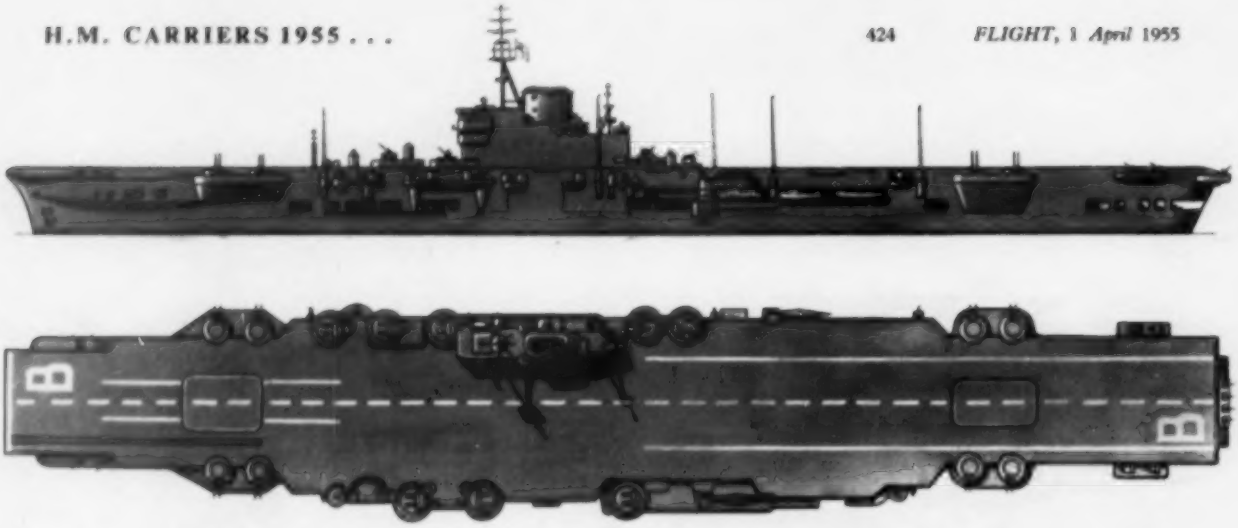
ROYAL CANADIAN NAVY

ON LOAN from the Royal Navy, *Magnificent* (laid down in July 1943 and completed in April 1948) is Canada's only aircraft carrier in service at present. Arrangements were made in 1952 for the purchase by Canada of a sister-ship, *Powerful*, work on which had been suspended in May 1946. Following the resumption of construction in July 1952, plans were revised to provide for a completely modern carrier: flight deck and lifts have been strengthened, an eight-degree angled deck and improved arrester gear are being incorporated, and the ship will have the steam-type catapult. Re-named *Bonaventure*, the new carrier is due to be completed in October next year, after which she will replace *Magnificent*.

The Canadian Naval Air Squadrons, previously operating Sea Furies, Avengers and Fireflies, are now being equipped with American-built McDonnell Banshee fighters and Piasecki HUP helicopters, and Grumman CS2F anti-submarine search/strike aircraft built under licence by the Canadian de Havilland company.

H.M.C.S. MAGNIFICENT **Displacement** 19,550 tons **Length** 695ft **Beam** 80ft **Complement** 1,350 **Aircraft capacity** 34

From Albion, above, a Sea Hawk is catapulted.
Right, vigilance on plane-guard—the attendant Dragonfly.
Lower right, a Sea Hawk caught hook, line and Centaur.
Below, the interim-angled, mirror-sighted Albion.



H.M.S. INDEFATIGABLE *Displacement* 32,850 tons *Length* 766ft 1in *Beam* 95ft 9in *Complement* 2,200 (wartime) *Aircraft capacity* 72

WARTIME FLEET CARRIERS

OF THE FIVE remaining ships of this class, *Implacable*, *Indefatigable*, *Indomitable*, *Illustrious* and *Victorious*, the first four are now in Class 3 reserve, while *Victorious* is undergoing a major modernisation which is due to be completed in December 1957.

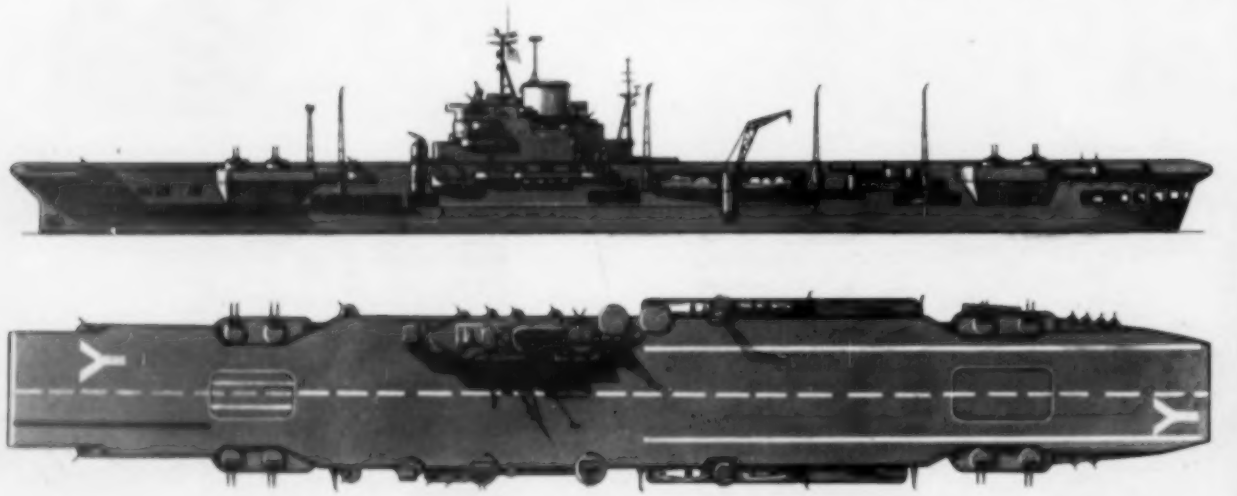
Illustrious and *Victorious* were both ordered under the 1936 Naval Estimates, and were completed in May 1940 and May 1941 respectively. A third ship of the *Illustrious* class, *Formidable*, was ordered in 1937, completed in November, 1940, and was scrapped in 1953. *Illustrious* was refitted and considerably modernized during 1948, and again refitted between November 1950 and May 1951. In March 1950, *Victorious* entered Portsmouth dockyard for re-building and modernization.

This modification will involve an increase in the length of *Victorious* of 35ft and a 7ft addition to its beam. A fully angled deck, side aircraft-lift and steam catapults are being fitted, and the ship's displacement will be increased to some 30,000 tons. When this reconstruction began, *Victorious* was in the best condition of all the ships in this class: when completed, she will be effectively an up-to-date fleet carrier.

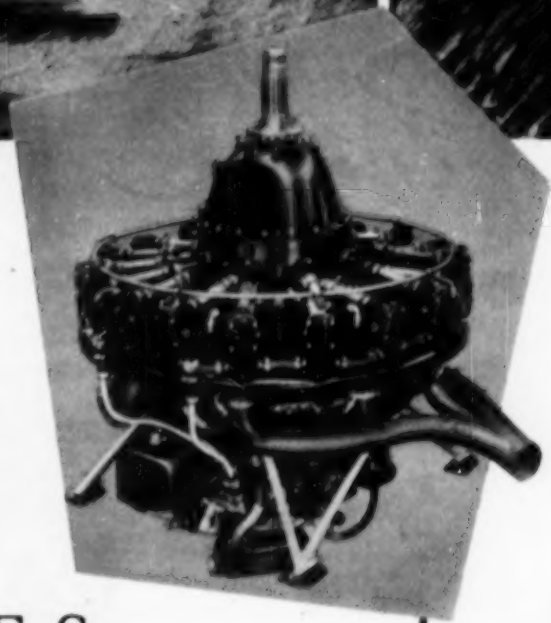
Two *Implacable*-class ships (the second being the *Indefatigable*) are also in reserve. These ships were ordered in October 1938 and June 1939 respectively, and completed in August and May of 1944. They each incorporate two hangars, one above the other (the after lift serving both) as opposed to the single long hangar, at quarterdeck level, of the *Illustrious* class. *Implacable* was refitted in 1948–49 and was flagship of the Home Fleet from May 1949 to July 1950, after which she was refitted for service in the Training Squadron from November 1951. *Indefatigable* was taken out of reserve in 1949, and the following year completed a refit at Devonport for employment in the Training Squadron. Both were reduced to the reserve last summer.

The remaining wartime fleet carrier now in reserve is the 30,000-ton *Indomitable*, laid down in November 1937 and completed in October 1941. The original design was similar to the *Illustrious* class, but incorporated an upper and a lower hangar. During an extensive refit and modernization during 1948–50, bow and stern were rebuilt on similar lines to the light fleet carriers of the *Glory* type, and the bridge was remodelled. Aircraft capacity is 65.

H.M.S. ILLUSTRIOUS *Displacement* 31,790 tons *Length* 753ft *Beam* 95ft *Complement* 1,600 *Aircraft capacity* 54



Serviceability



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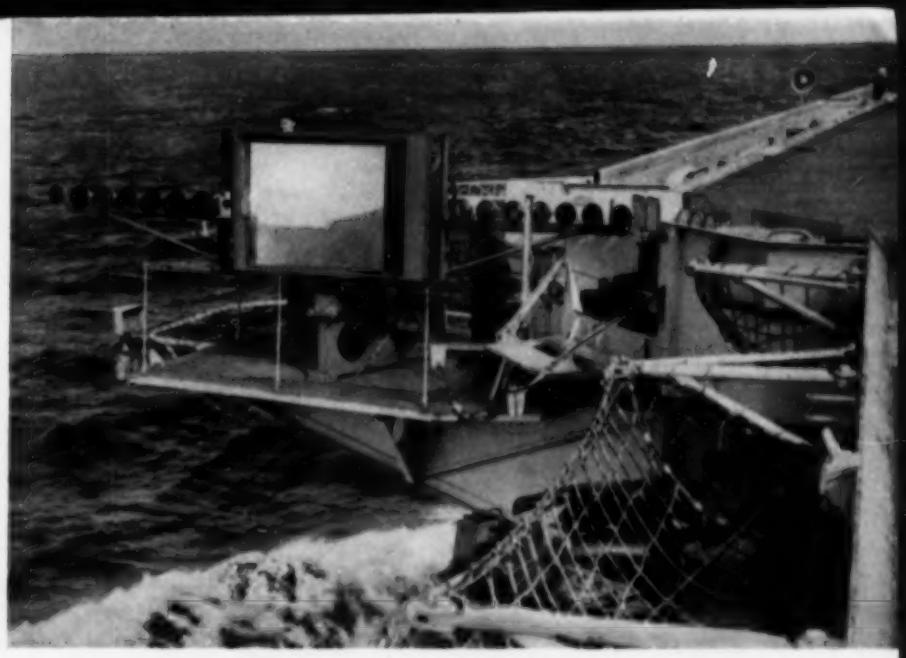
Recent Inventions to Increase Efficiency on the Flight Deck



In H.M.S. "Albion" the mirror sight is placed 360ft from the stern, on the port edge of the flight deck. The horizontal row of lights in this installation are green.

CARRIER DEVELOPMENTS

THE operation of a modern aircraft carrier calls for a very high degree of skill, training, teamwork and practice. But the demands which are already being made by the introduction of new types of aircraft have necessitated corresponding improvements in the ship itself, and several inventions have done, or will do, a great deal to increase the effectiveness of our carriers. Five such developments are described below, and it is worth noting that four of them were conceived in Great Britain.

The Angled Deck. A conventional deck can be divided into three regions, as shown in the uppermost of the three accompanying sketches. At the rear is the landing area, across which are laid the arrester wires which engage with the hooks of aircraft "landing-on." The mid-part of the deck is the barrier area, and the fore-part is employed as a parking area, and for the launching of aircraft from catapults.

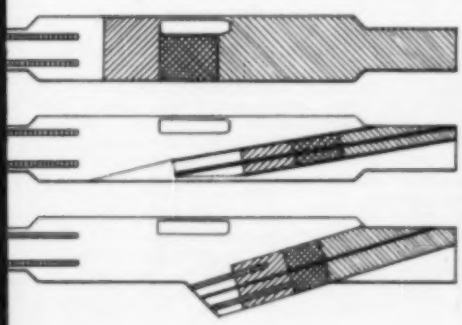
The term "barrier area" may require explanation. On the conventional type of deck (now known as the "axial" deck), any aircraft which landed, but failed—for any reason—to be arrested, had to be prevented from running into aircraft and personnel in the deck park forward. Barriers were therefore erected. Usually three in number, the first pattern consisted of three cables stretched across the deck at a height of four to eight feet, into which the airscrew of the offending aircraft could run. Turbojet aircraft required the introduction of a different type of barrier: a large net-like barricade about 12ft high with a continuous nylon periphery linked by transverse canvas strips. The nose of the aircraft runs into the centre of the barrier and the latter then wraps itself around the wings and, being attached to arrester units, brings the machine to a halt. But even a mesh barricade may not always be capable of arresting fast, heavy aircraft of the future, particularly if their wing sweep is acute.

Like most types of aircraft, carrier-based machines have always tended to become heavier and to land faster. One result of this trend is that the "pull-out" of the arrester gear has steadily increased, as also has that of the barriers; thus the size of the deck park has gradually become insufficient for its proper function. Furthermore, the inevitability of a barrier crash (with its probability of more than superficial damage to the aircraft) in the event of missing the wires had the effect of significantly reducing the "expectancy of life" of aircraft, and of requiring a considerable increase in number of machines purchased in order to fill a given operational demand.

In August, 1951, discussions were held with a view to establishing the optimum layout of deck for future carrier operations. Two men—Capt. D. R. F. Cambell, D.S.C., R.N. (then Deputy Chief Naval Representative at the M.o.S. and now in command of *Ark Royal*), and Mr. Lewis Boddington, A.M.I.Mech.E., F.R.Ae.S. (then at the R.A.E., now Director of Military Aircraft R. and D., M.o.S.)—conceived the idea of laying out the landing area at an angle of some 10 deg (starboard to port) to the ship's centre-line. Thus aircraft failing to pick up a wire were enabled to open up and "go round again" over the unobstructed deck. Previously, overshoot action had to be initiated well back on the approach, in order to ensure clearance over the deck park at the fore-end of the ship.

Barriers are rendered unnecessary, except for the rare occurrence when an aircraft becomes mechanically incapable of picking up a wire—as would happen in the event of its hook breaking. Furthermore, large carriers can have two sets of catapults, one or a pair being installed on the projecting part of the angled area, so that aircraft can be launched at almost twice the rate previously possible. Reference to the sketches also shows that it becomes possible to park aircraft much farther aft than before, by overlapping the landing area. It has been estimated that full "angling" has the effect of increasing the effective length of the deck by about 40 per cent.

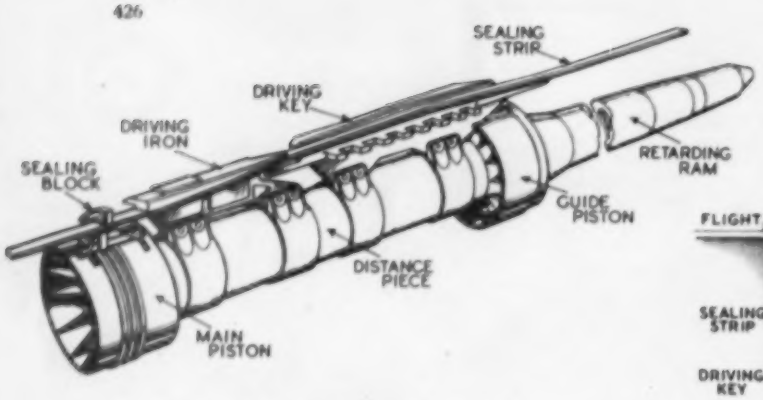
The first ship to be fitted with a full angled deck was U.S.S. *Antietam* (*Flight*, July 10th, 1953), the alignment in this carrier being at just over 8 deg (10 deg is recommended for future conversions). British carriers are at present being "semi-angled" at 5½ deg as an interim measure, this modification merely involving reconstruction of the arrester gear and sundry other details. An exception is H.M.S. *Hermes*, which will be commissioned with a fully angled deck and port-side extension.



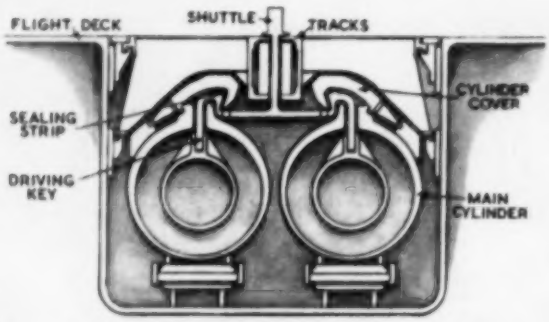
Simple plan-view sketches to illustrate (from the top) the axial deck, the interim angled deck and the fully angled deck. The deck areas are, from the left, the deck park (unshaded), the barrier area and the landing area, the last two regions overlapping. Catapults are also indicated.

The Steam Catapult. Various forms of aircraft-accelerating device have been in Royal Naval service for over 30 years, initially to enable fighting ships to carry reconnaissance aircraft and later to permit carriers to launch aircraft when steaming out-of-wind. Power was at first obtained from compressed-air bottles; later, the controlled combustion of cordite was employed, and later still the hydro-pneumatic type of catapult was introduced. This last is employed on nearly every carrier in use today, and consists of a hydro-pneumatic ram connected to cables which, passing over a multiplying pulley system, actuate a trolley mounted on rails level with the deck.

Owing to the inexorable growth in aircraft weight and launching speed, the capacity of catapults has increased to a point at which any further increase in the forces and velocities required would demand an installation too big and heavy to be reasonably mounted in a ship. Accordingly an entirely new method of



The steam catapult is shown below in cross-section. The pair of cylinders can be seen, linked to the aircraft-towing shuttle which runs along the deck. A single piston assembly is illustrated on the left; the tapered retarding ram, described on this page, is shown shortened.



CARRIER DEVELOPMENTS . . .

launching was sought. The most promising solution was found to be the use of a long, slotted cylinder, supplied with high-pressure steam from the ship's boilers (a convenient existing source of great power), in which was mounted a comparatively light reciprocating piston.

As shown in the diagrams, there are two slotted cylinders in the Royal Navy's steam catapult, mounted below the deck and extending side-by-side for the whole length of the catapult. These cylinders are fed with steam from large receiver-vessels under the control of a separate hydraulic system. The cross-section shows the manner in which the cylinders are sealed by a rectangular-section steel strip which is bent to a curve of large radius by the passage of the piston assembly, afterwards returning to its seating in the slot. Through the gap left by the raised sealing strip passes a tongue projecting from the driving key, the tongues from the left- and right-hand cylinders carrying dogs which are arranged to engage with a shuttle mounted on the flight deck.

When the catapult is fired, under the control of stations in the machinery compartment and at the side of the flight deck, the aircraft hold-back link is broken and the aircraft is accelerated forward by the throttle and towing bridle—to the accompaniment of a goodly cloud of steam.

The stroke of the catapult is virtually limited only by the deck space available, and the pistons and shuttle are the only moving parts. As the latter reach the forward end of their travel, the tapered retarding rams (see drawing) are pushed into massive cylinder extensions which, in a very ingenious manner, are kept full of bubble-free water, flowing helically around the walls to the far end and axially back down the centre. The high-velocity displacement of this water through the narrow annulus between the rams and the cylinder chokes, and the deflection of the water by annular buckets at the bases of the rams, brings the whole catapult assembly to rest. The mechanism is then returned to the firing position by hydraulic power.

The steam catapult was designed and developed by Brown Bros. and Co., Ltd., of Edinburgh (a director of the company, Mr. C. C. Mitchell, O.B.E., B.Sc., M.I.Mech.E., A.F.R.Ae.S., being particularly responsible, and Mr. J. R. C. Waterston having conceived the retarding mechanism). Trials were carried out in H.M.S. *Perseus*, and it is now the Admiralty's intention to replace all hydro-pneumatic units by catapults of this type. Ships now being converted include H.M.S. *Ark Royal*, *Hermes* and *Victorious*, H.M.C.S. *Bonaventure* and several American carriers.

The Side Lift. For many years the U.S. Navy have employed "deck-edge elevators" to hoist aircraft from the hangar to the deck. Such devices resemble the lifts of British carriers but are mounted on the side of the ship; American carriers, not particularly adapted for cold-weather operation, employ open-sided hangars alongside the lift. The advantages of such a layout are many, and include the possibility of much easier ranging and striking-down and simpler movement both on the deck and in the hangar, but British ships have only recently begun to have such equipment (known in British parlance as the side lift).

Such ships as *Ark Royal* have been equipped with large side doors to the hangar deck communicating with a side lift, the latter running up to fit neatly into the re-entrant portion immediately forward of the angled-deck extension on the port side. In *Ark Royal*, a side lift and two centre-well lifts are fitted, all supplied by the Fraser and Chalmers works of the General Electric Co., Ltd.

The Mirror Sight. The operation of advanced types of aircraft from carriers requires, in general, the maintenance of closer limits on the approach path than those normally needed for similar machines working from land bases. In the past, the pilot of an aircraft landing on a carrier has been assisted during his approach by signals from a skilled Landing Signals Officer—or "batsman"—whose task it is to assess and govern the approach up to the point at which he can order "cut" or give a "wave-off." (In practice, a "no cut" technique is now used, as described under the sub-heading "Carrier Circuit" on page 427.) Such an arrangement involves lags in the reaction times of both parties concerned; so much so, that the Admiralty and M.o.S. began to search for a better scheme—which would, in any case, have been rendered essential upon the introduction of later types of aircraft with higher landing speeds.

The solution was suggested by Cdr. (E) H. C. N. Goodhart, at present Air Engineer Officer to the Naval Staff, B.J.S.M., Washington (a qualified test pilot who was, at the time, technical secretary to the C.N.R., M.o.S.). Like the tricks of the 19th century stage, Cdr. Goodhart's idea is "all done with mirrors"—or, rather with one large mirror, concave about a vertical axis, mounted on the port side of the deck and gyro-stabilized against movements of the ship.

On each side of the mirror is fixed a row of aft-facing coloured lights; and a set of white lights is mounted abaft the mirror, facing forward. When a pilot aligns himself on his approach path (in American parlance, when he "gets in the slot") he sees the white lights reflected as a blob of light in the centre of the mirror. As long as he keeps this blob aligned with the horizontal row of coloured lights he knows that his approach path is correct. The curvature of the mirror also makes the reflected lights visible to the pilot as he turns in towards the carrier.

It is therefore possible to carry out a very accurate approach without referring to any other instrument or aid. The elevation of the mirror can be set according to the type of aircraft concerned so that, as the pilot flies down the flat beam of light, his wheels pass just over the tops of the arrester wires.

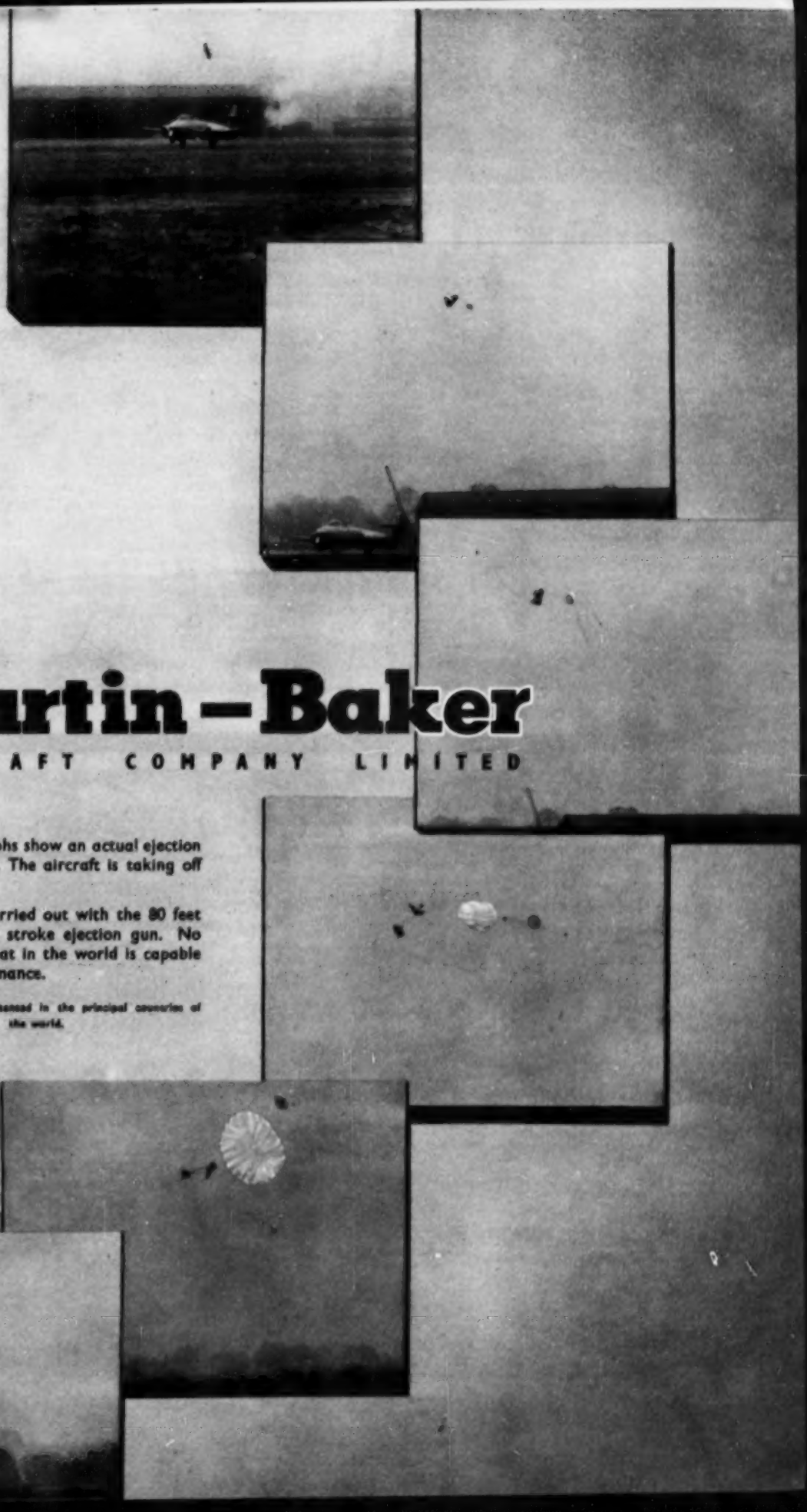
Assisting Cdr. Goodhart in the development of the mirror sight were an M.o.S. team led by Mr. D. Lean of the R.A.E. Some 20 pilots were engaged in trials on board H.M.S. *Illustrious* and *Indomitable*; the first trials were made by Lt-Cdr. T. G. Innes, A.F.C., and the late Lt. A. E. Facer (whose death was not connected with the device), and night landings were first made by Lts. W. Noble, D.S.C., and A. G. H. Perkins, neither of whom had previously deck-landed at night.

Ultimately, it is intended that one or more installations of the mirror sight will be provided on all carriers and at Naval Air Stations.

Audio Airspeed Presentation. The speed of approach of deck-landing aircraft, at present between 85 and 110 knots, is expected to rise to a foreseen maximum of around 150 kt. Allowing for a wind over the deck of 35 kt, this means that present closing speeds will shortly rise to at least 110 kt—an increase of 40 per cent. This will clearly have the effect of further reducing the time in which a pilot can assimilate approach information and apply it to his landing. In fact, under the established method of landing, the introduction of faster aircraft would have overtaxed any pilot during the critical period of the final approach.

The mirror sight has done much to ease the problem of keeping to the correct approach path; effort was therefore concentrated upon finding an improved method, preferably non-visual, of transmitting airspeed information.

The first specialized type of airspeed indication for Naval use was the mounting of a conventional instrument outside the cockpit, where it could be seen without taking the eyes away from the direction of the approaching deck. Another solution was the fitting, in a prominent position, of an A.S.I. with an extended scale; and another was the "flashing light" system. The latter



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CARRIER DEVELOPMENTS . . .

marked a real advance, and consisted of a special windscreen panel on to which was projected a light, variously red, yellow or green according to whether the airspeed was too fast, too slow or correct. The only severe shortcoming of this device was that it was impossible to make it bright enough on a sunny day.

One pilot noticed that, when the flashing light changed colour, he heard a distinct click in his head-set, and he used this click as an index of his speed. It was but a short step from this to the realization of the Audio—although the latter represents an intensive programme of development. Briefly, it consists of two small boxes, which can be mounted anywhere in the aircraft, one being a pitot-triggered sensing unit and the other a two-note organ sound-producer. The latter is energized at all airspeeds below the minima for lowering undercarriage and flaps, and it produces a continuous note so long as the approach speed is correct (the equipment can be set according to the type of aircraft and the loading) but, immediately the speed begins to depart from the selected band, a distracting signal is initiated. The emission can be superimposed upon speech without detriment to either signal and can also be transmitted by R/T for evaluation, checking or training purposes.

In its present form, Audio is provided with a three-position selector with which the datum speed for signals can be altered to provide for landings made at weights very much less, or greater, than the usual landing weight. Although stalling and approach speeds vary with loading, angle of attack does not, and it is quite feasible to set a device like Audio to signal departure from the optimum approach angle of attack (rather in the nature of a stall-warning device). In this event, no datum-shift would be necessary. Developments along these lines are now going forward.

Carrier Circuit: A pilot does not usually fly circuits from carriers, but the following very abbreviated notes indicate the sequence of actions involved were he to do so from a modern vessel:—

Cartridge start; unfold wings; range forward on catapult; secure hold-back link and towing bridle; open up to full power; catapult fired; airborne, bridle jettisoned and gear retracted; carry out circuit in usual manner; drop hook, undercarriage and flaps (as appropriate) on downwind leg and turn in; watch mirror sight and start flat approach at three to four degrees with enough power to permit overshooting in the event of missing all the wires; line up with the angled deck; adjust descent path according to mirror sight, while listening to Audio to maintain the correct airspeed; touch deck and cut the engine only when arrested by a wire.

All the new devices are complementary. Together they have made an incalculable contribution to the fighting ability of the modern carrier; more than that, it is not too much to claim that, without the devices mentioned above, the operation from ships of aircraft comparable with the latest land-based types would have been impossible.

MANBY REUNION

The New Six-month Course at the R.A.F. Flying College

THE Royal Air Force Flying College at Manby, Lincolnshire, was the venue last week for a most distinguished gathering of officers; the occasion was the annual reunion dinner and the passing-out of the fifth course. The Chief of the Air Staff was himself present, as were two other members of the Air Council, C.-in-Cs, and A.O.C.s, including A. Cdres. Charlesworth and McLachlan, R.A.A.F.

A. Cdr. G. A. ("Gus") Walker, Commandant of the College, proposed the guests. He managed to refer to the majority of those present—and a few absent ones—and to say something about the work of each of them and the help they had given to the College. This he did without there being any suggestion of a duty parade of names. It was, we felt, a sincere, helpful and informative welcome. The Commandant also spoke of the period of uncertainty through which the College has recently passed. He said that the matter of the guillotine poised delicately over the head of the Flying College had at last been brought to a satisfactory conclusion when in January the Air Council decided to ensure and underwrite the future of the College.

The Commandant thought that ex-members of the College would be wondering how the shortened course was going to compare with the previous longer ones. Hitherto, approximately 12 months had been allotted to a course but this would now be reduced to six. It should be categorically stated that the aim had been at least to maintain, if not to improve, the standard of graduate; and there was no question of an attempt to increase greatly the annual output, which would lead inevitably to a lowering of the standard of candidates on intake. The staff was maintaining the fundamental philosophy of the academy—to marry practical flying with theoretical studies—and were this philosophy ever to be set at a discount, as long as manned aircraft featured in the front-line then surely it would be a sad and fateful day for the R.A.F.

The revised flying syllabus provided for the students to do all the operational exercises which had been covered heretofore in the main operational roles. This included the training of pilots to navigate the Canberra. It was hoped that in the not-too-distant future the Meteors would be replaced by Hunters. But inevitably some aspects of the course had been recast. In particular, the standard of pilotage ability on entry had been raised and, in consequence, the length of the refresher phase would be reduced. In the same way, some of the basic academic revision had been reduced. The long overseas flights had had to go by the board. Those who had enjoyed them would regret their passing, and it would now be necessary and possible, with the speed and range of modern aircraft, to include as much interesting flying as possible in the future courses to provide the correct balance and variety.

High-latitude flying for the navigators in the Canberra, and the special flights by *Aries*, would remain essential elements of the charter of the College in order that the staff and students might have experience in modern aircraft of limit flying in its widest sense under all conditions of latitude, height and temperature.

Next the Commandant referred to high-altitude flights which had been made by No. 5 course. He said that during the year new ground had been broken in the use of bases for the high-latitude navigation training flights. Last July, both Hastings had flown successfully to the North Pole on two successive days from Bodö in northern Norway.

This had paved the way for an epic flight by *Aries* (still a B.2 Canberra), and on this occasion fitted with a 500-gallon overload tank. Operating from Bardufoss (lat. 69 deg 10 min), W/C. Humphrey, with S/L. Bower and F/L. Wood as navigators, flew to the geographic North Pole and landed back at Bodö, 67 deg 20 min. They had been diverted to this base by bad weather and instrumental troubles. This flight gave a minimum track distance of over 2,600 nautical miles, and the navigation was carried out solely by astro. This was a flight of outstanding merit.

Navigator students on the course who had previously flown to the North Pole in a Hastings were given further experience in a series of flights in *Aries* in December, which were again conducted from Bodö to latitudes between 85 and 87 deg North. The course was wound up by pilots flying Canberras in pairs out to Idris, one flying and one navigating on the way out, and changing seats for the return journey.

Before making his concluding remarks, the Commandant referred to the tragedy of the loss of two outstanding officers in inexplicable accidents. He was, however, glad to report that no other students had been involved in a flying accident.

A. Cdre. Walker said in conclusion that the flow of officers to commands and directorates could not be solely one-way. If the qualitative output was to be maintained, there must be a high-quality intake. The Commandant was sure that the College would continue to make a notable contribution to the efficiency and economic employment of the front-line of the Royal Air Force.

In his response for the guests, the C.A.S., Marshal of the Royal Air Force Sir William Dickson, spoke without notes and mainly off the record. In the course of his talk, which touched upon the implications of the hydrogen bomb, he said that station commanders would be extremely important in any new war. It might be necessary "to fight and fly stations." He said that the operating efficiency of officers must be fostered by the R.A.F. Flying College and only selected people would go to Manby at all.

The health of No. 5 course was proposed by the chief instructor, and the response was by G/C. P. B. Wood.

AVIATION AND GOLF

THE Aircraft Golfing Society has just started what looks like being a particularly busy sporting season, with over a dozen matches fixed. For the first time, the Society is to visit Paris officially when, on June 11th—during the Aero Show—they will enjoy the hospitality of the Racing Club de France at the La Boulie Golf Club, near Versailles. The Ultra Electric Trophy match will be played on this occasion.

The annual dinner takes place at Grosvenor House, London, today, April 1st.

Membership now stands at 175, and there are vacancies for 25 new members, who must be associated with the aircraft industry. The hon. secretary is Mr. Brian D. Songhurst, 40 Haven Green Court, London, W.5.

"FLIGHT" photographs

The D.H. Heron "John Hunter" seen in formation from its companion aircraft "Sir James Y. Simpson." The Heron was selected because of its particular suitability for short-stage operations between restricted airfields in bad weather.

SCOTLAND'S AIR AMBULANCES

A Service in Great Demand: Two B.E.A. Herons go into Operation

AS briefly recorded last week, two D.H. Herons have been delivered to Renfrew for the B.E.A.-operated Scottish Air Ambulance Service. The D.H. Rapides which they replace will be taken out of service on April 17th. The Herons as delivered have standard 14-seat interiors and the conversion to ambulance layout is being done by B.E.A. Each will be altered so that two stretchers, mounted on a tubular frame, can be fitted or removed quickly and easily.

Speaking at the naming ceremony—the aircraft were named *John Hunter* and *Sir James Y. Simpson*—Mr. Robert McKean, B.E.A.'s manager in Scotland, gave a brief survey of the service and its history. He explained that the Air Ambulance Service was initiated on May 8th, 1933, being operated by Midland and Scottish Air Ferries from Islay in the Western Isles, and by Highland Airways in the North of Scotland; and its operation had been continued by Northern and Scottish Airways, Scottish Airways and British European Airways.

In 1935 and 1936, the Argyll and Inverness County Councils respectively included it in their schemes of public health and hospitals facilities for the islands, and the local medical officers of health were given discretionary powers to avail themselves of the service.

When the patient could not afford to pay for the charter, the local authority concerned was given powers to waive the charge and two-thirds of the cost to the local authority was refunded by the Department of Health from a special fund.

As the service became known, more and more use was made of it. In the early days no special aircraft were kept for ambulance purposes, seats were removed as necessary from the regular machines to make room for a stretcher. In particularly urgent cases a machine would be diverted from a scheduled service, the off-loaded passengers completing their journey by relief aircraft.

From small beginnings there has evolved a highly specialized unit, operating with its own aircraft flown by highly skilled crews. The figures in the table below indicate the steady development:—

	Flights	Patients	Mileage
1933-42	540	600*	150,000*
1943	55	70	20,000
1944	59	70	20,000
1945	94	120	20,000
1946	141	160	30,000
1947	147	180	30,369
1948	245	285	67,635
1949	304	340	78,908
1950	240	290	57,175
1951	268	325	60,312
1952	276	346	62,208
1953	277	358	66,791
1954	274	320	59,020
Grand Totals	2,920	3,464	722,418

*Approximate totals.

In 1948, when the National Health Service came into being, the Regional Hospital Board became responsible for all ambulance services, including air, and the entire cost is now borne by the N.H.S. The transfer resulted in the utilization of the service being nearly doubled.

The service is based at Renfrew Airport and covers all scheduled airfields in Scotland—Campbeltown, Islay, Tiree, Benbecula, Stornoway, Barra, Inverness, Dyce, Wick, Turnhouse, the Orkney Islands and Shetlands, and also airstrips such as those on Colinsay, Coll, Sollas and Northton Beach (Harris), and one or two of the islands in the Orkney group.

The two new B.E.A. Herons on the apron at Renfrew Airport, together with one of the Islander class Rapides which they supersede.

Miss Jean Jolly, O.B.E., matron of the Southern General Hospital, Glasgow, who performed the naming ceremony, with Capt. David Barclay, M.B.E., who is in charge of the ambulance flight.

While the new aircraft were being named an urgent call came from Campbeltown and a Rapide and crew were despatched. Left to right: Capt. R. A. Curry, Sister M. S. Welsh and R/Off. W. V. Greatorex.

About 85 per cent of the calls are from the Kintyre peninsula and the Western Isles, and accordingly it is from Renfrew that most of the flights are made, and to Glasgow hospitals that most of the patients are brought.

Renfrew-based aircraft also carry patients from the Hebrides to Stornoway and Inverness, and occasionally to Aberdeen and Edinburgh, and from the Orkneys, Shetlands and Wick to Aberdeen hospitals.

The decision that a patient is to travel by air is made by the local practitioner, and frequently it is the first part of a patient's journey from some of the more isolated places, particularly in the Western Isles, which is the longest and most difficult. It may start with a possibly rough crossing by rowing-boat, continuing by ambulance, or even a lorry, over many miles of heavy going to reach the airfield or airstrip. Such journeys, however, are rather the exception, and from villages or townships served by good roads transport is usually very quick.

The doctor telephones in the first place to the mainland hospital to secure his patient's admission and then asks the local B.E.A. official at the airport concerned for an ambulance flight, giving particulars of the patient and a provisional diagnosis, so that any special equipment can be prepared. He also indicates the degree of urgency, whether relatives or friends are travelling with the patient and, finally, to which hospital the patient is to be taken.

B.E.A. are usually able to have the aircraft ready to fly within an hour of receiving any call and during this time a car is sent to the Southern General Hospital in Glasgow to pick up a nurse, who might be any one of a number who have volunteered to hold themselves in readiness for these flights during their off-duty periods. They receive a small honorarium for each flight.

The pilots, in many cases, fly in weather which normally would ground other aircraft and much of the success of the operations is due, of course, to the skill of the radio officers.

Dr. A. Buchanan Barbour, B.E.A.'s chief medical officer, has prepared certain rules for pilots of ambulance aircraft. He has had very wide experience in aerial ambulance work and aviation medicine. These rules are adapted to local conditions and recommend certain limitations for air ambulance cases. For example, a head-injury case should preferably be flown at under 5,000ft; again, when flown out of rough airfields, fractures call for the shortest safe take-off runs.

Whilst an aircraft is on its way back with a patient, St. Andrew's Ambulance or the Red Cross are notified and an ambulance is despatched, to be on the tarmac awaiting the arrival of the aircraft.

The names selected for the two Herons are very appropriate. John Hunter was the famous eighteenth-century Scottish anatomist who is regarded as the founder of scientific surgery and Sir James Young Simpson (1811-1870) was the renowned pioneer in the use of chloroform as an anaesthetic in surgery.

MR. GEORGE WATSON

A SAD loss was suffered by Blackburn and General Aircraft, Ltd., with the sudden death on March 20th of 60-year-old Mr. George Watson, B.E.M., manager of their experimental department at Brough. He had been at work before the week-end, and his passing came as a great shock to Mr. Robert Blackburn, for Mr. Watson was his oldest employee. He joined the firm in 1909 and, apart from a period in the R.N.A.S. during the first world war, had served with them continuously.

He was responsible for all experimental and development work at Brough. Eighteen months ago he received his second 21 years' service award from Mr. Blackburn, who always referred to him affectionately as "my oldest apprentice." Mr. Watson was held in high esteem by his colleagues at Brough and he will be greatly missed for, apart from his work, he was always consulted as the unofficial historian of the company. He leaves a wife, a son and two daughters.

THUNDERSTREAK AUTOPILOT CONTRACT

AN order has been placed by the U.S.A.F. with Lear, Inc., Santa Monica, California, for a large number of MB-2 autopilots. They are all due to be installed in F-84F Thunderstreaks and RF-84F Thunderflashes, in accordance with Strategic Air Command requirements, and production is already under way at the company's Grand Rapids, Michigan, Division.

As mentioned in *Flight* of February 18th, the MB-2 is the mid-point in development between the F-5 (standard on F-84Gs and F-86D all-weather intercepters) and the advanced L-10 intended for supersonic aircraft. The MB-2 contract is for $6,662,700 (about £2,400,000).

There are three Lear factories, at Santa Monica, Grand Rapids and Elyria, Ohio. Principally, the company makes autopilots, flight instruments, radio communications and navigation equipment, guided missile components, aircraft and industrial pumps, and valves. Lear also carries out prototype engineering of aircraft modifications and builds the Learstar twin-engined executive.

N.Z. "TOP-DRESSING" REPORT

READERS will recall that on March 18th we published an article on the operation of agricultural aircraft in New Zealand. Its author made the point that no aircraft in current use entirely met the often conflicting requirements of—in particular—top-dressing operations, which form the bulk of the Dominion farmer's aerial work. Now comes a report on the findings of a committee set up last year to investigate the supply of aircraft for such purposes, and it largely bears out our contributor's contentions. The principal findings, as released by the Minister in Charge of Civil Aviation, Mr. T. P. Shand, are that:—

(1) Generally speaking, no standard aircraft in current production can comply fully with the established requirements.

(2) The modification of standard aircraft cannot result in an entirely suitable top-dressing type.

(3) The interest taken by three overseas manufacturers in the special needs of the industry in New Zealand should result in the production of aircraft which will satisfy the requirements of operators insofar as equipment of half-ton to three-quarter-ton capacity is concerned.

(4) Efforts should be made by fertilizer manufacturers to ensure the adequacy and continuity of superphosphate supplies suitable for aerial application.

(5) Operators should study advantages to be gained from standardizing on acceptable types of aircraft.

(6) Operators should recognize the importance of relating the capacity of their combined fleets so far as practicable to the availability of fertilizer, otherwise uneconomic conditions may well arise within the industry, with consequential repercussions on the operators and on the farming community.

The committee also drew attention to the corrosive effect of fertilizers on aircraft structures and engines, and recommended that the Civil Aviation Administration and the aircraft operators in collaboration should study that matter further and perhaps institute technical research into the general problem.

THE INDUSTRY

Belfast Prize-giving

NINETY apprentices of Short Bros. and Harland, Ltd., received awards at the company's prize-day, held recently. Rear Admiral Sir Matthew Slattery, chairman and managing director, told the audience of relatives that the Short organization was insuring for the future by training boys who could ultimately become senior employees and executives. The company were spending something like £30,000 a year on such training; they were now building many things in addition to aircraft—guided missiles, for example—and wanted electrical and electronic engineers, physicists and metallurgists.

Comparing the proportion of design personnel in the United States with that in the British aircraft industry, Sir Matthew said that while Short's and their associates the Bristol Aeroplane Company between them mustered about 2,000 people on the design side—omitting the engine division—one American aircraft organization had 6,000 on their design staff alone. From this it was obvious that there was plenty of scope for the boys that Shorts were taking on.

Mr. David Keith-Lucas, director and chief designer, announced that a prize in memory of the late Mr. A. W. S. Clarke, who was the company's chief engineer, would be awarded next year and would be open to all Short Bros.' apprentices. The boys would be invited to submit an essay on any mechanical or aeronautical subject on which the company was engaged.

Production of Rolled Sections

UNTIL recently, certain types of rolling and cold-forming equipment for profiling metal strip have been chiefly an American monopoly. Curiously enough, when a British firm of specialists in rolling and forming techniques began design and manufacture of machines of this kind—in response to a request that would reduce the exodus of dollars for American plant—one of the first practical results was the United Kingdom production of steel sections for a patented American constructional framing system.

The British firm are Daniel Smith, Ltd., Castle Iron Works, Peel Street, Wolverhampton, and it is their claim that the majority of leading British aircraft embody cold-rolled sections formed on their machines. Their "Multiversal" rolling machines are made in 1¼in, 2in, 2½in, 3in and 4in sizes. There is, it is stated, virtually no limit to the number of stations that can be incorporated in one machine for the production of difficult or compound (including seam-welded) sections.

The constructional framing system referred to above, known as "Unistrut," is manufactured by Joseph Sankey, Ltd., at their Hadley, Shropshire, works. It is based on the use of steel channel section 1⅝in square, cold-rolled from 12 s.w.g. material and available in 10ft and 20ft standard lengths. It is treated with a rust-proofing material and stove-enamelled olive green; hot-dip galvanized finish is also available. A range of fittings, together with patented locking nuts permits unlimited variety of assemblies.

The system also includes a range of clips and clamps to accommodate pipe or cable from ⅜in to 8in diameter, fittings being attached to the channel section without drilling or welding. Another variety of "Unistrut" consists of standard channel section modified for insertion in concrete to provide anchorages for pipe clamps and other fittings on walls and ceilings.

Mr. Thomas P. Collier, of Chicago, appointed exclusive representative of the Plessey Co., Ltd., in the U.S.A. He is an engineer with long experience in international trade.

Mr. A. I. O. Davies, who becomes technical sales manager of Smiths Aircraft Instruments, Ltd., in succession to the late Mr. G. T. Perkins. He joined the technical sales staff in 1947.

At Short Bros. and Harland's apprentice prize-giving (reported in Column 1): Lady Slattery presents an award to apprentice G. A. W. Moore; on the left is Mr. O. Carlile, assistant apprentice supervisor.

Mr. David Crombie

ON March 22nd, only a month before he was due to retire, Mr. David Crombie, head buyer of the Bristol Aeroplane Company's engine division, lost his life in a road accident.

Employed during World War I on the production of heavy guns by William Beardmore and Co., he made his first contact with the aircraft industry in 1916, when he became assistant to the manager in charge of a contract for the Beardmore Dragonfly engine.

In 1919, Mr. Crombie left to manage a small Birmingham engineering and foundry plant, but returned to his old firm just over two years later, working on aero engines and diesel engines for airships. He went to the Bristol engine division as chief buyer in October 1928.

He leaves a widow and three children.

Epoxy Resins for Foundry Patterns

THE versatile epoxy resins are now being produced for making plastic patterns. Aero Research, Ltd., of Duxford, Cambridge, who are responsible for the development of "Araldite" casting resin M for pattern-making, state that shrinkage on setting is very low indeed, and quite negligible when fillers are used. It is also claimed that the hardened resin is tough, durable and dimensionally stable. The material sets cold in 24 hours, or in a shorter time if gentle heat is applied.

The introduction of the epoxies into this field is expected to arouse considerable interest in foundries, and should contribute significantly towards reducing production costs.

IN BRIEF

Recent publications of Jenks Brothers, Ltd., Britool Works, Wolverhampton, include a conversion table (leaflet No. 463/1) for nut tightening torque data. Tables are for foot pounds to metre kilogrammes, inch pounds to centimetre kilogrammes, and *vice versa*.

* * *

Additional information concerning the New Welbeck vacuum cleaners referred to in our issue of February 25th is that the range includes 24-volt machines which can be operated from batteries on airfield vehicles.

* * *

Mr. K. Zdziarski, M.I.Ex., manager of the export sales division of Auto Diesels, Ltd., left England on March 24th for a four-month tour of South America. He will be strengthening existing agency arrangements and appointing new agents in ten South American countries and also in Trinidad and Jamaica.

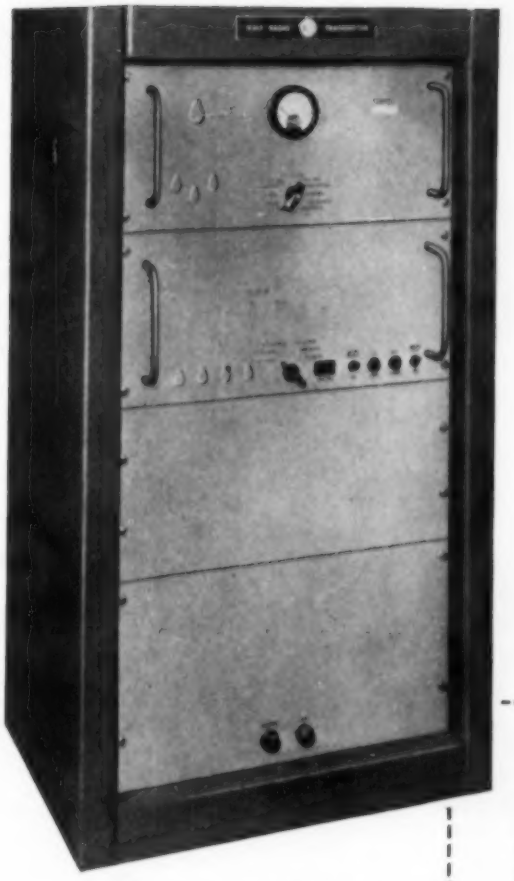
* * *

Export Packing Service, Ltd., have added a packing design and development department to their Chipping Warden (near Banbury) centre. Operating on the same lines as the design section opened last October at the company's main centre at Sittingbourne, the new department will give Midlands manufacturers a specialized service for the study of packing, transit and storage problems.

* * *

Lord Kershaw, O.B.E., J.P., has been appointed chairman of the two major companies in the group now being developed by Mr. H. W. Bowen, O.B.E., M.I.Mech.E., who last year acquired the business of High Pressure Components, Ltd. Since then Mr. Bowen has taken over Sun Engineering (Richmond), Ltd., and its subsidiary, Davies Coleman, Ltd.; he will continue as deputy chairman of the group and managing director of H.P.C.; and Sir Wolstan Dixie, a director of H.P.C. and Sun Engineering, will continue as general manager of the former company.

Ground to air operation by VHF airfield communication equipment



Marconi Equipment

Type AD 801/818 provides . . .

Optimum intelligibility and range.

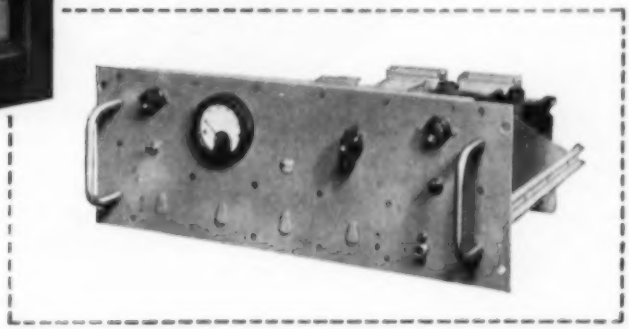
Simplicity of operation.

Complete reliability in all climatic conditions.

Flexibility in choice of initial installation and facility for easy addition of channels to meet increased traffic.

Remote control from up to five positions.

Simultaneous broadcast on up to ten channels for multi-channel operation.



Shown above is the type AD 801 transmitter. It is compact and sturdy and, when fitted with shock absorbers, suitable for mounting in a vehicle. On the right is the type AD 818 receiver designed for aerodrome use in association with the AD 801 transmitter.

More than forty Airlines and twenty Air Forces fit Marconi air radio equipment. Marconi airport installations are in use throughout the world.

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Airport and Aircraft Radio Systems

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Partners in Progress with The **'ENGLISH ELECTRIC'** *Company Ltd.*

LA 8

IL FIAT G.82 impiega Leghe Nimonic*

Questo aeroplano da addestramento é derivato dai precedenti G.80-1B e G.80-3B, muniti di motore De Havilland "Goblin"-35, mentre sul G.82 é montato un Rolls-Royce "Nene" RN2/21.

Esso é l'anello di congiunzione ideale tra i primi aeroplani da addestramento e quelli militari ad alta velocità di oggigiorno e raggiunge una velocità di 930 Km/h in volo orrizzontale.

I motori montati sul G.82 e sui G.80-1B e G.80-3B, impiegano le leghe Nimonic per diverse parti, come le palette della turbina e del distributore e i tubi di fiamma.

In Italian, as in any language, Nimonic Alloys are specified for use where resistance to high-temperature oxidation, fatigue and creep is required as in the Rolls-Royce "Nene" of the Fiat G.82. The Nimonic series of heat-resisting alloys are used for the rotor blades of every British aircraft gas turbine in production.

* *NIMONIC is a registered Trade Mark.*

HENRY WIGGIN & COMPANY LIMITED · WIGGIN STREET · BIRMINGHAM 16

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Light Flying-boats

THE correspondence during the last week or two in *Flight* on the subject of light flying-boats has made interesting reading. It led me to look up, in the 1933-34 edition of the *Air Annual of the British Empire*, page 264, a photograph of the Parnall Prawn.

This seems to have been a most intriguing little machine but no particulars appear in the text relating to it. The serial is S1576 and, from the photograph, one is led to believe that the thrust-line was variable by the pilot for taxying purposes to prevent the airscrew touching the water.

The Prawn has not been mentioned in your correspondence and would appear to have been a very small single-seater indeed. Has anyone any details concerning its size, purpose of the experiments and any information about the engine fitted and its unusual installation?

London, N.8. P. M. H. LEWIS.

THE correspondence in your columns which has followed the small paragraph, "Cockle-shell", which appeared in your November 19th issue reveals there is a good deal of interest in light flying-boats and some conjecture as to which one qualifies for the claim to be the smallest.

The Short Cockle has been mentioned several times and was illustrated in *Flight* on February 25th, so it occurs to me that your readers may like to know some more about this interesting little machine. As regards any claim on size (or should I say "lack of size"?) one is given to wonder what is the definition of "smallest." Offhand I cannot remember the exact dimensions of the Cockle but I am in no doubt that it was physically larger than either the Finnish Eklund or the Dutch Scheldemeeuw, both of which have been referred to by correspondents; but it was probably lighter and certainly much less powerful than either of those pleasing little craft.

The two standard 697 c.c. Blackburne motor-cycle engines which powered the Cockle, driving tractor airscrews directly through extension shafts (for c.g. reasons the engines were mounted well back on the wing), gave a total b.h.p. of 22 at the revolutions used. Mr. Chamberlain [Correspondence, February 25th] mentioned that engine starting was by means of levers in the cockpit. He is quite right. The appropriate lever was coupled by wire cable to a rack and pinion on the engine, much in the manner of the modern motor-cycle kick starter, and the system worked well.

Originally the Cockle was named the Stellite and, with the Satellite (a similar-sized landplane fitted with a Bristol Cherub 32 b.h.p. engine) was one of a pair of experimental light aircraft produced as a practical try-out of one of Mr. Oswald Short's brilliant brainwaves that a fuselage or hull could be constructed monocoque style in light alloy—in other words, on the stressed-skin principle.

The flying-boat's first few attempts at flight were not successful although it ran beautifully on the water at a speed of 45 m.p.h. —not a bad speed for any water craft of this power in those days. I finally succeeded in getting it off in October 1924—incidentally, under the civil registration letters G-EBKA—after the wing incidence had been increased. As was to be expected, it was somewhat under-powered. According to my log its service ceiling was about minus 3,000ft. Indicated speed at take-off was 27 m.p.h. and maximum level speed 57 m.p.h. However I was fairly light and by dispensing with all unnecessary paraphernalia such as jacket and shoes I was able on occasion to get higher than 2,000ft.

About a year later, as the hull had shown no sign of failure nor developed any leaks or suffered much from that dreadful nightmare corrosion, it was acquired by the Air Ministry for research work at the seaplane experimental station at Felixstowe. The civil marking was accordingly replaced with Service roundels and the R.A.F. No. N193 proudly displayed. Unfortunately most of the officers were weightier than me and, although they generally managed to get off the water, to remain airborne thereafter called for the exercise of considerable piloting skill. However, a good deal of flying was achieved, particularly by the lighter pilots; but the heavyweights—notably, I think, the "three Cs," Carnegie, Cahill and Cross—had to resort to bathing trunks.

So well did the Cockle survive that in 1927 it was decided to replace the Blackburnes with Bristol Cherubs, thereby increasing the power from 22 to 64 b.h.p. In this guise it flew extremely well—though to me something of its original delightful smoothness and fascination was lost by the fitting of these bigger, horizontally opposed, engines.

It continued to fly at Felixstowe for several more years. It eventually finished up, I believe, at Cranwell, as a working model with which cadets could practise the art of erection and overhaul.

Heathfield, Sussex. J. LANKESTER PARKER.

Transport-pilot Training

THE problem of obtaining civil aircrew in the years to come, and its solution, have far-reaching implications. Training pilots is an uncertain and expensive business, for nobody—not even the trainees—knows to which branch of flying he is most suited. A prospective fighter pilot may, after a year's training, find that he would make a far better bomber or transport pilot, and vice-versa. It will, therefore, be seen that to set up a training establishment to train one type of pilot will only lead to a high wastage rate, or to unsuitable pilots, or both.

If the R.A.F., with the only large training establishment in the country, had a use for transport pilots—that is, if Transport Command were expanded to fulfil its appointed duty as the air transport service for the military forces—these pilots could, at the end of say a five-year short-service commission, join airlines.

With a considerable number of hours on world routes with modern aircraft, and with both right- and left-seat experience, they would be ideal.

They would have spent sufficient time practising aerobatics and formation flying to benefit from these activities, but would also have spent the maximum time in large transport aircraft, using all the current navigational and blind-landing techniques.

Providing Transport Command was kept properly equipped, they should be able to go straight into the Corporations' aircraft without further ado.

Essendon, Herts. D. HOUSTON.

Harvards Still in Harness

I NOTE that in your Service Aviation pages for March 18th you record the retirement of the Harvard. This, however, is not quite true, for this company has a current contract for overhauling Harvards for the R.A.F. and we are assured that they will remain in service for at least another year or two.

These aircraft are operated by university air squadrons, who still use them for advanced training after a pupil has completed his elementary course on Chipmunks; admittedly the number is small, but they are certainly used very actively.

Derby Airport. DAVID F. OGILVY
Derby Aviation, Ltd.

IN BRIEF

The Racing Pigeon is preparing a report on the work of pigeons, particularly in the saving of lives of aircrew during the Second World War. The editor, Mr. W. H. Osman, says that he has information concerning the birds but is anxious to get in touch with any aircrew members who have had their lives saved through the use of pigeons, and he would be grateful if they would write to *The Racing Pigeon* at 19, Doughty Street, London, W.C.1.

(Left) This photograph of the Short Cockle flying-boat, referred to above by Mr. Lankester Parker, was taken after it had acquired a Service identity; but its wings still bore civil markings. (Right) the highly unconventional Parnall Prawn mentioned by Mr. P. M. H. Lewis; it is believed to have been powered with a 65 h.p. Ricardo-Burt engine.

Imperial War Museum photographs

The commanding officer of No. 27 Sqn., S/L. P. W. Helmore, D.F.C., A.F.C., with his crew, F/O. D. W. Williams and F/O. I. R. Tilly, after completing a sortie from Nicosia

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

CANBERRAS IN CYPRUS

THE photographs on this page show something of the recent one-month detachment of two squadrons of Bomber Command Canberras from Scampton to Cyprus. The event was indicative of the Command's new policy—foreshadowed by the Under-Secretary of State for Air in his speech on Air Estimates—of sending such squadrons on regular training and reinforcement exercises to the Middle East.

The Canberras were the first R.A.F. jet bombers to take part in exercises in the Mediterranean area. Among their other operational assignments was a six thousand-mile flight to Kenya, Aden and the Persian Gulf, interception exercises in the Canal Zone, a goodwill visit to Cairo and concentrated bombing practice on the Cyprus ranges.

As reported in *Flight* at the time, the Canberras landed at Nicosia on February 18th within six flying hours of leaving Scampton. They began intensive practice on the bombing ranges at Dhenia, near Nicosia, continuing until the two-day NATO exercise "Blue Trident One" began on February 28th. In this the Canberras' target was a carrier task force of the United States 6th Fleet in the Ionian Sea. Simulated bombing attacks were launched on the first day from R.A.F. Nicosia and on the following day from Idris in Libya. On March 8th four aircraft of the No. 27 Squadron flew to the Canal Zone to take part in a two-day exercise with M.E.A.F. squadrons. Based at Kasfareet, the Canberras flew to neighbouring Jordan, where attacks were carried out on the Mafraq bombing range.

On March 12th the same Canberras flew to Cairo at the invitation of the Egyptian authorities; they were the first R.A.F. combat aircraft seen in the Egyptian capital since the abrogation of the old Anglo-Egyptian Agreement three-and-a-half years before. The Canberras' good-

At lower left is W/C. J. D. Warne, D.S.O., D.F.C., who led the detachment; at lower right the Canberras are shown being re-armed, each with its load of two triple frames of streamline 1,000 lb bombs. Centre are the C.O. of No. 21 Squadron, S/L. N. B. Freeman, A.F.C., and F/O. A. Chapman and F/O. G. L. Clarke of No. 27 Squadron, helmeted in the modern style. On the right is a refuelling study in blue skies and sunshine.

THE

HAWKER HUNTER

Aeronautical experts recognise the Hunter as the most formidable fighter in production today. Its armament is far superior to any other interceptor and its stamina has been proved on regular service with the R.A.F. The outstanding performance of the Hawker Hunter has won the largest U.S. off-shore order yet placed for NATO — $182,000,000. Independent orders have also been received from Sweden, Denmark, Belgium and Holland.

HAWKER Hunter

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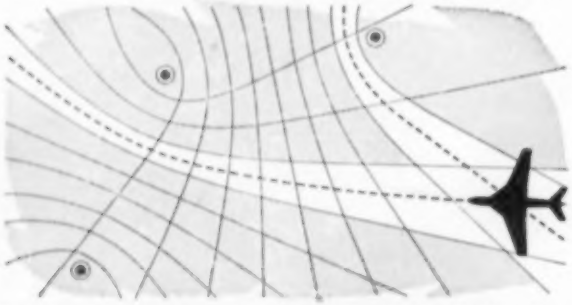
PIONEER . . . AND WORLD LEADER IN AVIATION

Problems of flight

ON THE BEAM

By flying down a beam pilots can come into an airfield they cannot see and could not possibly find. With this invaluable technique man has rediscovered a gift he may once—long ago—have had : one that many creatures have in highly developed, highly efficient form.



Butterflies cross seas and make safe landfalls; the Chinook salmon swims oceans and returns, infallibly, to the very pool of the very river in which he was born ; a pair of finches divide their year, season after season, in a particular bush in an English garden and another in a North African orchard. Most astonishing of all, the homing pigeon can be taken in any direction, for any distance, and after a turn or two in the air will fly unhesitatingly straight for home.

How does the pigeon do it ? We do not know. We may never know. It is not sight, nor smell. If it is sense of direction, this must be developed to a degree of sensitive infallibility which puts it clear beyond human understanding. We can only say that —like hundreds of kinds of migratory creatures— the pigeon feels some mysterious, unmistakable pull towards home : that he senses some "radio beam" that gives him his direction.

Though we may never know the mechanics of the homing pigeon's "beam", we imitate its effects. Landing under any but the best daylight conditions can be difficult indeed without this navigational aid we have copied from Nature.

Pilots who come in to land on a beam or off it, have come to value, at all Britain's major airfields, the excellent and helpful service of the Shell and BP Aviation Service.

SHELL and BP AVIATION SERVICE

Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, London, W.C.2.

Distributors in the United Kingdom for the Shell, BP and Eagle Groups.

Copies of this advertisement can be obtained from Shell-Mex House.

SERVICE AVIATION . . .

will visit to Almaza airfield, marking a renewal of the traditional friendship between the R.A.F. and the Egyptian Air Force, began with a formation fly-past above Cairo. On landing, the crews were met by senior Egyptian Air Force officers, including the A.O.C.-in-C., A.V-M. Sidky Mahmoud, and the Eygptian Chief of Military Administration, A. Cdre. M. Shawky Yakout. Sir Ralph Stevenson, the British Ambassador, and A. Cdre. C. M. Heard, the Air Attaché, were also there to greet them.

After inspection by the official guests, the Canberras did a number of low-level runs in different formations over the airfield before returning to the Zone. On March 11th, a flight of four of No. 21 Sqn. Canberras, led by S/L. N. B. Freeman, began a six-day 6,400-mile flight to Kenya, Aden and the Persian Gulf.

In Kenya the aircraft flew low over the loyal reserves, where native chiefs gathered to see them, and also over 12 selected points in Mount Kenya and the Aberdare Ranges where the Mau Mau were active. At Aden two days later they flew over border areas of the Protectorate and then returned over the port itself. On March 15th they crossed Saudi Arabia to Bahrein, and the following morning a flight was made over the Palace of the Ruler of Dohar, on the east coast of the Qatar Peninsula. Afterwards the Canberras followed the Trucial Oman coast to Sharjah and flew over Dubai before returning to Bahrein. Mr. Burrows, the British Political Resident in the Persian Gulf, was a passenger.

The aircraft returned direct to Nicosia, having covered 6,400 miles in 13 hr 35 min —only five minutes over the flight-plan schedule. On the day these aircraft returned to Cyprus, the remainder of the force began the second NATO exercise "Red Trident One" in the Aegean Sea.

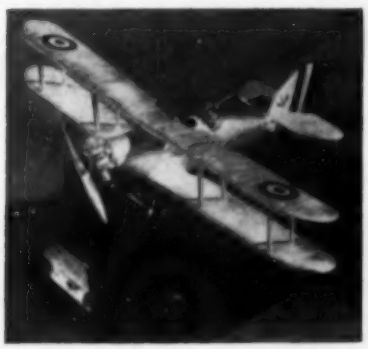
The force flew home *via* Idris on March 19th and 20th, staging interception exercises with aircraft from Malta *en route*.

Cranwell Cadets' Easter Activities

GLIDING and canoeing in France and mountaineering in Scotland are among the activities planned by flight cadets of the R.A.F. College, Cranwell, for their Easter leave, which extends until April 27th.

Two parties, each of ten cadets and two officers, are hoping to attend a ten-day gliding course at St. Auban-sur-Durance, one of the best known Continental soaring sites, and a further four flight cadets, travelling in two canoes, plan to voyage down the Seine from Paris to Le Havre. Another party of five, with two officers, is planning a week's walking and bus travelling holiday in the South of France.

Leave plans for those cadets remaining in the United Kingdom include mountaineering and ski-ing in Scotland, and visits to Navy, Army and U.S.A.F. units.



A silver and bronze model of a Westland Wapiti was presented last Friday to No. 601 (County of London) Squadron, R.Aux.A.F., by Shell Mex and B.P. Ltd.; Mr. F. A. Keeling, a director, made the presentation. No. 601 was equipped with Wapitis from 1929 to 1932.

The Duchess of Gloucester inspects the guard of honour on arrival at Mount Batten during her recent tour of Service establishments in the West Country. Commanding the guard is F/L. P. Wevill, and W/C. W. H. Flint, Station Commander, is in attendance on the Duchess.

Fox Squadron Presentation

ON Friday last, at Claridges Hotel, London, Sir Richard Fairey presented a silver model of the Fairey Fox to No. 12 Squadron. It was accepted on the unit's behalf by the commanding officer, S/L. F. C. D. Wright, D.F.C. Guests at the ceremony included Air Marshal Sir George Mills, C-in-C. Bomber Command, and A.V-M. S. N. Webster, who were both in No. 12 when it had Foxes (A.V-M. Webster was also a Schneider Trophy winner); Marshal of the R.A.F. Lord Trenchard; and Air Chief Marshals Sir John Baker and Sir Ronald Ivelaw-Chapman.

No. 12 Squadron was unique in being the only squadron to have had Foxes, which in 1926 were some 50 m.p.h. faster than other bombers then in service. The fact is commemorated by the fox's head which appears in the squadron badge. The unit is now at Binbrook and flies Canberras.

R.A.A.F. Director of Operations

AFTER having recently returned to Australia with the mission which visited the British and American aircraft industries, G/C. B. Eaton has been appointed Director of Operations. He succeeds G/C. K. R. J. Parson, who now will command the Central Flying and Navigation School at East Sale, Victoria.

R.N.Z.A.F. in Malaya

OPENING a foreign affairs debate in the House of Representatives on March 24th, the New Zealand Prime Minister, Mr. Holland, announced that in addition to raising an airborne commando for jungle warfare in Malaya, he had recommended the Government to make available half of a reconnaissance squadron, at present based in Fiji.

These two units are in addition to No. 14 Squadron, which is due to leave Cyprus for Malaya on April 17th, and a half of a transport squadron. No. 14 Squadron, which now has Vampires, is later to be equipped with Venoms.

Mr. Holland indicated in his speech that New Zealand's traditional defence commitments in the Middle East were ended now that New Zealand lay in the direction of the Communist advance through Asia.

R.C.N. to Use Drones

ON the formation last month of No. 1 Drone Target Unit at H.M.C.S. *Shearwater*, the Canadian Naval Air Station at Dartmouth, N.S., the Royal Canadian Navy started using radio-controlled drones for anti-aircraft training.

The mobile unit will provide targets for surface-to-air A.A. practice by units of the East Coast fleet, operating under the direction of the Flag Officer Atlantic Coast. The targets will be maintained at H.M.C.S. *Shearwater*, and launched, controlled and recovered from a site at Osborne Head, east of the approaches at Halifax Harbour.

These American drone targets, of the Radioplane KD6G-2 type, have a wing span of 12ft, and are powered by an 80 h.p. piston engine. They can fly at a speed of about 200 kt, with an endurance of 90 min. Each aircraft is equipped with a parachute for recovery.

G/C. R. J. Burn, O.C. No. 6 F.T.S., congratulates P/O. E. M. Woodhams on winning the Certificate of Merit as the best all-round cadet at the R.A.F. Officers' Training Unit. P/O. Woodhams is the younger son of Mr. H. M. Woodhams, C.B.E., managing director of Sir W. G. Armstrong Whitworth Aircraft Ltd.

CIVIL AVIATION

Two of Lufthansa's four Convair 340s, hangared at Hamburg. The German airline's fleet will eventually include eight Super Constellations (four due for delivery this year and four in 1956).

VIEWS ON LUFTHANSA

TODAY, April 1st, is the scheduled date for the inauguration of Lufthansa's scheduled services in Germany. International flights within Europe (from Hamburg to London, Paris and Madrid) are to start on May 15th, and it is expected that transatlantic services between Hamburg and New York will begin on June 6th.

Speaking recently in Hanover, Herr H. M. Bongers (managing director) expressed the hope that the airline would achieve economical operation during 1957. Lufthansa planned to achieve this aim by concentrating temporarily on their inter-continental services (the frequency of transatlantic flights—to be six per week this summer—will be doubled during 1956, and flights to South America will be inaugurated). By 1957, the company should be offering some 650m passenger-miles annually.

In London last week, the International Transport Workers' Federation suggested that Lufthansa was seeking to introduce salary scales which would "endanger the economy of other air operators." The federation announced that it learned "on unimpeachable authority" that the airline sought to introduce flying-staff salary scales far below those of other European air transport undertakings; "rates offered are only 70 per cent of the average salary paid." This, the federation asserted, was undoubtedly unfair competition, to which the flying staff of all other airlines would take grave objection.

AIRBORNE WEATHER RADAR

THE main developments in the field of airborne radar, when used to give warning of hazardous weather, are summarized in a recent circular (with the above title) prepared by the I.C.A.O. Air Navigation Bureau. This discusses the basic principles of the relationship between the radar display and the corresponding atmospheric conditions, within the range of equipment available at present.

The circular is a slightly revised version of a working paper prepared for member-States prior to the fourth session of the I.C.A.O. Meteorology Division. In addition to sections on the fundamental principles of radar, rainfall intensity, cloud detection, the "bright band", "upper band", lightning, turbulence and rainfall intensity, and airborne radar equipment, the publication contains a useful list of references on the subject.

INSURANCE RATES AND RISKS

IN his report at the recent annual meeting of the Aviation Insurance Offices' Association the deputy chairman, W/C. E. G. Thomas, asked the question: "If our aircraft are to become still more complicated may not the risk to underwriters become heavier still?"

"What about the repair of these complicated examples of modern technology?" he asked. "Labour and material costs continue to rise, and it becomes more difficult to repair even minor damage *in situ*. These facts are certainly not reflected in rating."

W/C. Thomas continued: "It seems clear to me that the time has come for concerted action not only to resist the continued pressure for rate reductions, but to improve rates. Insurance costs are one of the smallest items of an operator's budget. They involve only some three to four per cent of his hourly operating costs and I suggest that the insurer is no longer a reasonable target for reductions in these costs . . . The market has expanded over the past few years but so has the volume of business. The total volume of business done by I.A.T.A. members during 1954 was over £700,000,000 and this was done by some 2,500 aircraft. This will emphasise one of our weaknesses—the lack of sufficient spread. The need for careful appraisal and rating of each particular risk is obvious."

CIVIL AIRCRAFT ACCIDENTS, 1953

SOME fifteen months after the end of the period under review, *A Survey of Accidents to Aircraft of the United Kingdom, in the year ended 31st December*, 1953 (H.M.S.O., price 1s. 6d.) has been published by the Ministry of Transport and Civil Aviation. It records that during the year there were 87 accidents to aircraft registered in the United Kingdom, twelve of which were fatal. Aircraft engaged in public transport were involved in 11 accidents, of which four were fatal. A total of 65 accidents (eight fatal) concerned light aircraft, in 28 of which, the Ministry states, the aircraft was being flown by a student pilot. Two non-fatal accidents to gliders were reported, and there was no accident involving a helicopter.

On the regular passenger-carrying services of U.K. operators, on which 1,432,337,000 revenue passenger-miles and 169,600 stage flights were flown, there occurred two accidents, involving 70 fatalities. Among the statistical criteria quoted in the survey are: stage flights flown per fatal accident, 84,800; aircraft miles flown per fatal accident, 29,401,000; passengers carried per passenger killed, 35,400; passenger-miles flown per passenger killed, 23,480,900; fatal accidents per 10,000 stage flights, 0.12; fatal accidents per million aircraft miles, 0.034, and passengers killed per hundred million passenger-miles, 4.3.

Of the eleven accidents to public transport aircraft, six were attributed to pilot error. For the first year since post-war records were started there was no accident due to collision with high ground; neither was any due to engine-failure.

The number of accidents to light aircraft showed an increase of some 50 per cent compared with 1952, for a 20 per cent increase in flying activity. Pilot error, according to the Ministry, was responsible for 44 of the 65 accidents. Stalling accidents numbered nine (almost double the 1952 figure); five others were due to a lack of appreciation of weather conditions; and ten due to failure of an engine of its accessories.

An analysis of the stalling accidents had indicated that the two main causes of the majority were (a) too low an approach speed for the prevailing conditions and (b) insufficient speed in a gliding or partial-power turn.

There were eleven accidents to types other than light and public transport aircraft, five of which are stated to be due to pilot error.

Tip-tanks are seen on this Super Connie of Northwest Orient Airlines, photographed taking off from Burbank. It is one of four destined for service on the Tokyo - Seattle great-circle route.

The D.H. Mk.70 Gipsy Queen Engines
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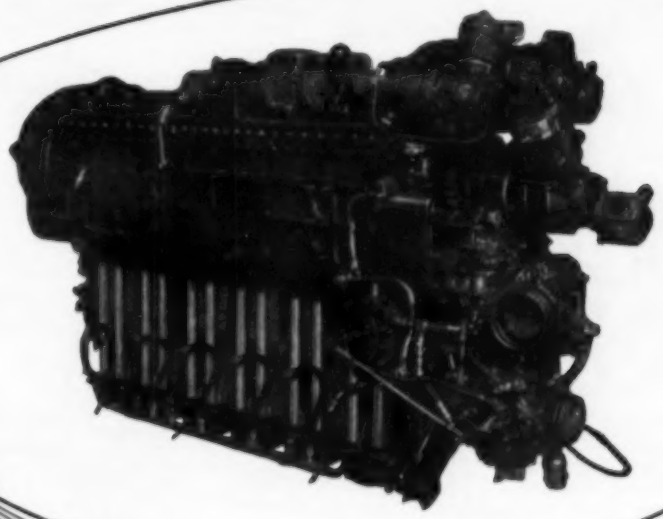

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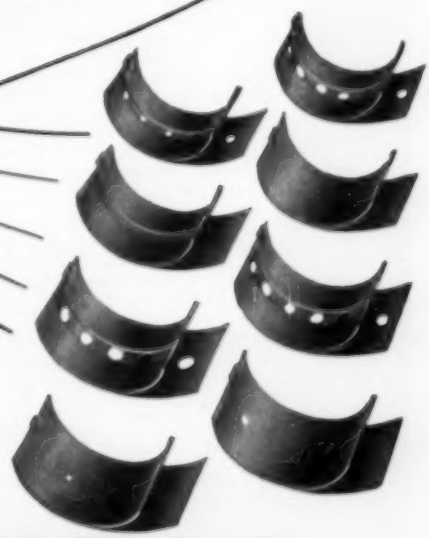

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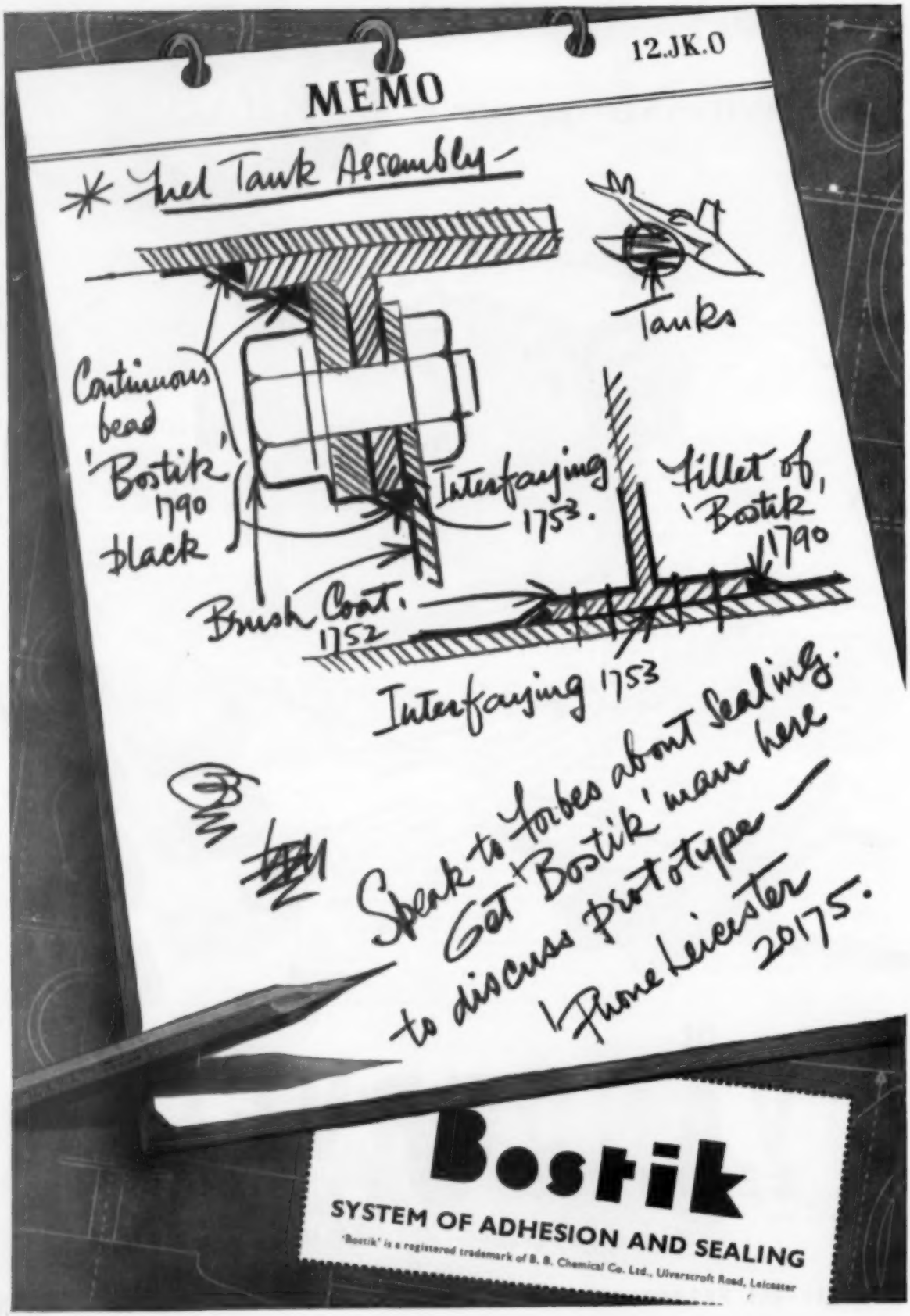
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CIVIL AVIATION . . .

NEW SUPER CONNIES FOR T.W.A.

FIRST deliveries are now being made in the United States of model L.1049G Super Constellations, powered, like the L.1049C, by 3,250 h.p. Wright Turbo-compounds, but embodying a number of detailed refinements. The new version has provision for wing-tip fuel tanks to give increased range, and its all-up weight has been increased from 133,000 to 137,500 lb. Some examples, including the first of the fleet of 20 ordered by T.W.A., will be equipped with storm-warning radar in a nose installation which increases the fuselage length by 34in. The type is being advertised as the "Super-G" Constellation by T.W.A., who were due to introduce it to regular service on their domestic trans-continental routes today, April 1st. As used by this airline the L.1049G will carry 66 first-class passengers; the fuselage is divided into three passenger compartments, a lounge and an eight-berth sleeper section. Also taking delivery of L.1049Gs are Northwest Orient Airlines, one of whose aircraft is illustrated on page 434.

RECORD SALES FOR DOUGLAS

SALES of Douglas commercial transports have recently reached a record level. During the first two months of this year 17 airlines placed orders valued at some £65m for a total of 109 aircraft in the DC-6/7 series. These orders bring the number of aircraft in the series sold to date to 819, of which 208 have yet to be delivered. This commercial backlog, valued at £125m, is the largest in the Douglas company's history.

The 109 aircraft ordered in January and February comprise 49 DC-6Bs, for delivery to eleven United States and six non-American airlines and 60 DC-7s, including 38 Seven Seas. The six airlines which have ordered this longer-range development of the DC-7 series are B.O.A.C., PanAm, Sabena, S.A.S., Swissair and—the most recent purchaser—Braniff International Airways.

VISCOUNT'S AMERICAN DEBUT

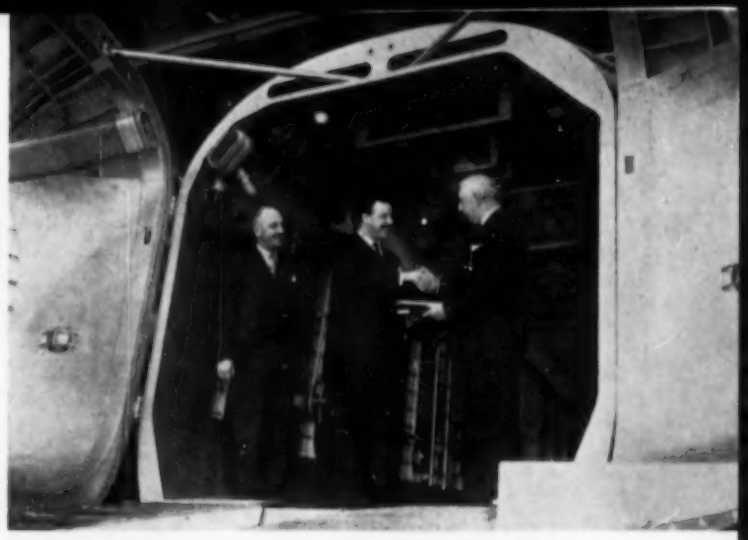
THE Vickers Viscount is due to make its North American debut today, April 1st, on the Montreal-Toronto-Lakehead-Winnipeg route of Trans-Canada Air Lines. Next Monday, April 4th, will see the Viscount's first appearance on scheduled passenger services within the United States—at Idlewild, New York, which will be linked with Toronto by five Viscount services, instead of three North Star flights, daily. On this route T.C.A. operate in competition with American Airlines, who use DC-6s.

T.C.A.'s introduction of the Viscount has been preceded by intensive crew-training, route proving and demonstration flights. Their first aircraft has already flown over 400 hr since its delivery in December. Last week several local demonstration flights were given at Idlewild, and a number of North American airline, Press, radio and TV representatives were given "courtesy flights" between New York and Montreal and Toronto.

NEW ATLANTIC CARGO RATES

A STATEMENT issued early this week by I.A.T.A. indicates that the member airlines who operate over the North Atlantic have, temporarily at least, patched up their long-standing disagreements as to the rate structure applied to cargo traffic on this route. Without the new agreement, which was reached at a special I.A.T.A. Traffic Advisory Group meeting in New York last Friday, an "open situation" would have occurred on expiry of the present rate structure on July 1st next.

The new system represents a compromise between the two basic schools of thought on cargo rating, one of which advocates larger discounts for bulk shipments, the other calling for increased application of the existing system of discounts for specific commodities. The number of commodity classifications will now be reduced to fewer than 50, but the present 30 per cent discount for general shipments of 440 lb or more will be dropped in favour of other bulk discounts within the commodity rating system.



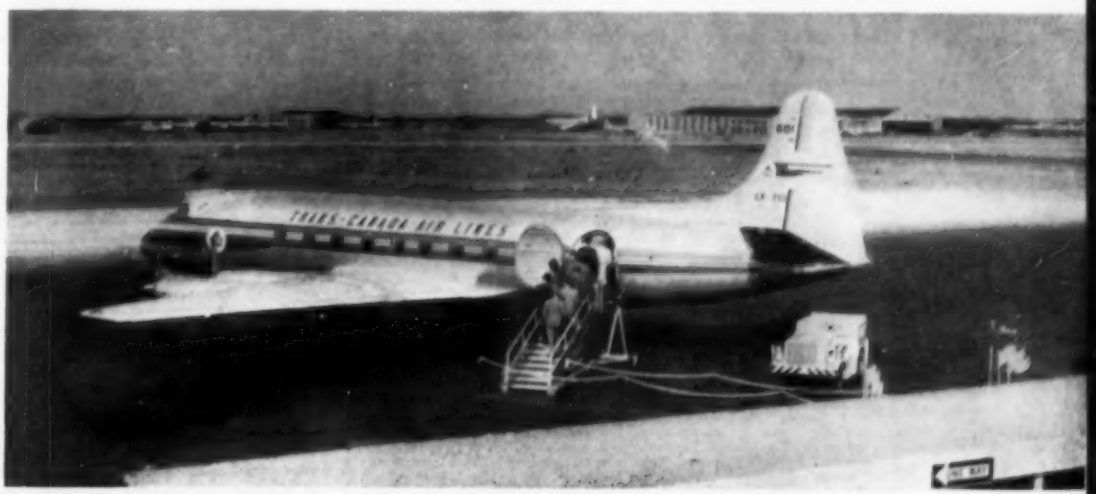
As recorded in a news item on p. 406, the Bristol Aeroplane Company recently sold their 200th Freighter. Here Mr. F. A. Laker, managing director of Air Charter, Ltd., accepts it from Mr. C. F. Uwins, managing director of the Bristol Aircraft division (right), while Mr. R. S. Brown, divisional general manager, looks on.

VIKING ACCIDENT REPORT

THE accidents investigation branch of the Ministry of Transport and Civil Aviation have published a report on the accident to Viking G-AIXS (operated by Airwork, Ltd.) at Blackbushe on August 15th, 1954. The aircraft had taken off from Blackbushe on a charter flight to Nice and, after oil had been seen streaming from the starboard engine, the captain feathered the airscrew and returned to Blackbushe. During the single-engined landing approach the machine struck the ground 135 yards short of the runway. The Viking was badly damaged and fire broke out.

The loss of oil from the starboard engine, the report concludes, was due to "gulping"—caused by the breakdown of the oil scavenge system. "Gulping has taken place on numerous occasions over the past 2½ years and the Bristol Aeroplane Company, Ltd., have recently introduced several modifications which they hope will alleviate and might eliminate it." None of the modifications were incorporated in the starboard Hercules in G-AIXS, as it had been installed before they were introduced.

The report expresses the opinion that "The accident was the result of the captain allowing the aircraft to stall when making a single-engined approach to land. A contributory factor was distraction of the captain's attention by the flickering of the undercarriage red indicator lights during a critical stage of the approach."



Passengers embark from Gate 18 at Idlewild, New York, for a demonstration flight in T.C.A. Viscount CF-TGI, flagship of the Canadian airline's new turboprop fleet. Regular Viscount services between Toronto and New York are scheduled to begin next Monday.

"Flight" photograph

Civil Aviation

CLUB AND GLIDING NEWS

THE fuselage of the first amateur-built aircraft of post-war design in Britain was laid down by Mr. Peter Masefield, president of the Popular Flying Association, at Hatfield Technical College on Saturday last. The machine, a Druine D.5 Turbi two-seater, is being constructed by "The T.K. Flying Group," which was formed last December by nine students and one staff member of the de Havilland Aeronautical Technical School. The aircraft is to be powered by a Walter Mikron of 65 h.p.

Members of the group, using the facilities of the Hatfield Technical College, are building the aircraft in their own time and at their own expense, at an estimated cost of £300. They are taking advantage of the new simplified procedures for the certification of ultra-light aircraft, recently announced by the Popular Flying Association.

After inaugurating the project by assisting in lowering the first fuselage-stringer into position, Mr. Masefield expressed the hope that a resurgence of "real amateur flying" in this country would follow. It was a pity, he said, that British aircraft companies had not supported the ultra-light movement (in particular, that the Fairey Junior was not being produced); thus forcing us to go to France for ultra-light designs.

Chairman and secretary of the group are C. Batten and T. J. R. Longley respectively, while the only non-student member is Mr. E. D. Cant, de Havilland's assistant apprentice supervisor.

Sets of plans and instructions for amateur construction of the Turbi can be obtained from the Popular Flying Association (Londonderry House, Park Lane, London, W.1), at thirteen guineas. This price includes the subscription for one year's individual P.F.A. membership.

A DEFICIT for 1954 of £1,302 was reported by the chairman of the Royal Aero Club, Mr. S. Kenneth Davies, C.B.E., at the annual general meeting of the club on March 23rd. To cover future financial requirements, he said, an increase in club subscriptions was proposed. A total of 117 new members had been enrolled during 1954, he continued, and at December 31st there were 1,543 full members, plus an additional 407 overseas members and 1,987 associate members.

Concerning private flying, the chairman said that 161 aircraft were being maintained under the schedules of the three-year C. of A. scheme, and the number of approved firms for such maintenance increased during the year to 54. The housing and parking card for use at state-controlled aerodromes in Britain was so poorly supported that the M.T.C.A. had withdrawn the concession on May 1st. While the Ministry had abolished landing fees at its aerodromes for club and group aircraft, R.Ae.C. efforts to obtain this concession for private owners had not been successful.

After announcing that members of the Aerodrome Owners' Association had agreed to waive landing fees and housing charges up to 48 hours for visiting foreign light aircraft, the chairman continued: "I feel that the Government should do more to encourage private ownership of aircraft. At present the private owner receives none of the petrol tax rebate given to flying clubs and is made to comply with regulations designed to control military and commercial aircraft movements. Nowadays many aircraft controllers and their staffs enforce regulations rigidly rather than with common sense. Some airfields close at 5 p.m., which means all flying must cease from that time, even in summer: surely it would be reasonable to permit pilots of light aircraft to land at non-Customs airfields after the control is closed, at their own risk?

"Further difficulties will be encountered this year owing to certain aerodromes refusing to accept small aircraft unless they have radio and, unless Lympne is re-opened or more aerodromes are provided with Customs, there may be pilots of smaller aircraft flying to and from the Continent being dangerously near their fuel margin in getting, or trying to get, to a Customs airfield."

Following the chairman's report, discussion took place on matters arising from it, and in particular on the question of the proposed increase in club subscriptions. Opinions were voiced that other means of raising the money should be found, but a formal amendment that a five-man committee be appointed to examine the matter—was defeated by 30 votes to 19, and the original proposal, that the club rules should be altered, to specify annual subscriptions for town and country members of 15 (instead of 12) and ten (instead of seven) guineas respectively, was carried by 23 votes to 15. There were approximately 70 members present.

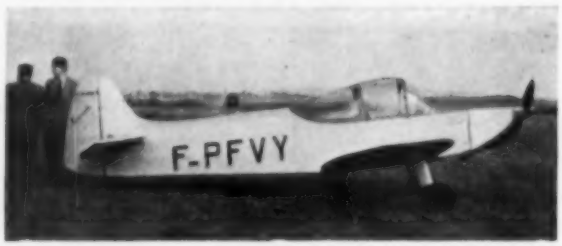
After the meeting, the presentation of the Geoffrey de Havilland Trophy for 1954 was made by Lord Brabazon to Lt. J. R. S. Overbury, R.N., for his London-Amsterdam Sea Hawk record.

FORTHCOMING EVENTS

Mar. 31-
Apr. 2. National Physical Laboratory: Symposium on Boundary-layer Effects.
Apr. 1-3. Aslib Aeronautical Group: Annual conference, Cranfield.
Apr. 2. British Interplanetary Society: "Problems of Heat Transfer in Rocket Motors," by H. Ziebland, Dipl. Ing.
Apr. 14. R.Ae.S. Graduates and Students Section: "Radio Aids for Navigation and Blind-landing," by Capt. F. Ormenroyd.
Apr. 14. Institute of Metals: Annual general meeting and discussion.
Apr. 14. R.Ae.S. Main lecture (at Glasgow): "Mixed Power in Modern Aircraft," by M. J. Brennan, B.Sc., M.I.Mech.E., F.R.Ae.S.
Apr. 15. Helicopter Association: "Noise Problems in Helicopter Design," by Prof. E. J. Richards, M.A., B.Sc., F.R.Ae.S.
Apr. 15. Scientific Instrument Manufacturers' Association: Annual Dinner and Dance, Dorchester Hotel, London.

R.Ae.S. Branch Fixtures (to April 6)

April 1, *Hatfield*, Annual dinner. April 4, *Bristol*, Annual general meeting and film show. April 5, *Glasgow*, "Twin Pioneer, Design, Production and Test Flying," by T. B. Lyon, J. Hislop and H. J. Capper. April 6, *Chester*, "Operation of Jet-engined Aircraft"; *Hatfield*, "Salvage Operation of the Imperial Airways Flying Boat *Corsair* in the Belgian Congo," by R. Sisson; *Luton*, "Aerial Photography," by Russell Adams; *Weybridge*, "Some Maintenance Aspects of Viscount Operation," by E. R. Major.



For amateur construction in the U.S.A. and France: prototype of the $800 M.I. Baby Ace, sponsored by the journal whose name it carries, and the improved Blairvacq-Piel CP-30 Emeraude. Both use 65 h.p. engines.

CURRENT issue of the Vintage Aeroplane Club's newsletter is accompanied by Chapter I of "History Book," devoted to the 1924 light-plane trials at Lympne. Other chapters of this new feature will describe aircraft and other events of the vintage-flying era; the spotlight next month is on the Hawker Cygnet.

A ciné section and a modelling group have recently been formed by members of the club. The vintage formation team is performing on the occasion of Denham's tea patrol on April 24th, and both clubs are participating in a television broadcast from Denham on June 30th. Also at Denham, the Vintage Club is planning a garden party, pre-war style, for Sunday, July 24th, for members only. Details of membership from Miss Joan Barker (hon. secretary), "Stanway," Denham Green Close, Denham.

DENHAM'S first tea patrol of the season is planned for Sunday, April 24th, between 3.30 and 4 p.m. The defended area is from one to three miles out, between 1,000 and 2,000ft and, ever the optimist, C. F. I. Wright warns visiting pilots that they are responsible for obtaining clearance from Northolt control in I.F.R. conditions. Eddie Hewitt, flying instructor and talented editor of the Denham newsletter, is leaving the club; his place as instructor is being taken by Jock Millett, while "Wilbur" Wright assumes the editorial responsibility.

CAMBRIDGE Private Flying Group now has some 55 members, the majority student pilots. One Tiger Moth, G-ANLG, bears the brunt of training and is operated at £2 per hour. A target of 200 hours for the first year's flying was handsomely exceeded, 300 being flown in the first ten months. Delivery of a Lycoming-powered Auster 5 is awaited (estimated hourly rate £2 10s), and it is hoped to hold an "at home" during the summer.

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The pteranodon was tough as prehistoric creatures go, but events proved too tough for him; when the second Ice Age started moving in he moved out. In his time he outclassed all his competitors, but he couldn't cope with the problems of low temperatures. The problems set by low temperature operation in the development of advanced types of aircraft are being constantly investigated by Esso research engineers, often in collaboration with design teams in the aircraft industry. As a result, there is now available to operators a range of Esso lubricating oils, hydraulic fluids and lubricating greases, all of which have been produced for low temperature conditions in all types of modern aircraft. If you have a fuel or lubricant problem don't hesitate to get in touch with us; if we cannot give you the answer straight off our files, we shall be happy to find it for you.

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The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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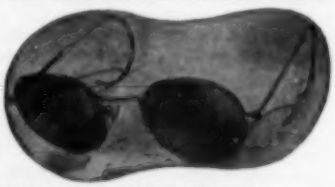

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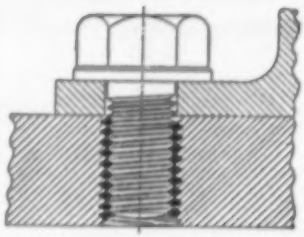

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:

APPLICATION No. 340/1. From Air Kruise (Kent), Ltd., of Lympne Airport, Kent, for permission to operate two additional return flights each fortnight on the seasonal inclusive tour service which the company has been approved by the Minister of Transport and Civil Aviation to operate with Dakota aircraft between Ferryfield and Turin, in conjunction with Blue Cars (Continental Coach Cruises), Ltd., at a frequency of two return flights per week for the period 1st April to 31st October, 1955.

FROM Lancashire Aircraft Corporation, Ltd., of 7, Berkeley Street, London, W.1:

APPLICATION No. 432/1 for permission to operate one additional return flight weekly on the seasonal inclusive tour service which the company has been approved by the Minister of Transport and Civil Aviation to operate with Dakota aircraft between Blackpool and Beauvais in conjunction with Air-Coach, Ltd., at a frequency of two return flights per week for the period 4th May to 5 October, 1955.

APPLICATION No. 433/1 for permission to include a traffic stop at Southend, on the seasonal inclusive tour service which the company has been approved by the Minister of Transport and Civil Aviation to operate with Dakota aircraft between Blackpool and Strasbourg in conjunction with Air-Coach, Ltd., at a frequency of one to two return flights weekly for the period 15th May to 2nd October, 1955.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [3513

THE COLLEGE OF AERONAUTICS

APPLICATIONS are invited for the Perring Scholarship in Aeronautics, valued £400 per annum, tenable at The College of Aeronautics. The successful candidate will be admitted to the two-year course at the College.

APPLICANTS should preferably be honours graduates or final year undergraduates in engineering, mathematics or physics; applications from non-graduates with comparable qualifications will also be considered. Candidates must be British subjects domiciled in the United Kingdom.

FORMS of application and statement of conditions will be forwarded on written application to:—THE Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks.

THE closing date for the receipt of applications is June 1st, 1955. [3415

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Quoting Ref. No. S.A.37.

PUBLIC ANNOUNCEMENTS

THE COLLEGE OF AERONAUTICS

English Electric Research Fellowship in Aeronautics

APPLICATIONS are invited for a Research Fellowship which has been established at the College by the English Electric Co., Ltd. The Fellowship is intended to provide opportunity for post-graduate research into problems of vibration or stability and control of aircraft, and is tenable for one year beginning on or about October 1st, 1955. The value of the Fellowship is £500.

APPLICATIONS, giving full particulars of education and experience, and quoting the names of three referees are required by May 1st, 1955, and should be addressed to:—

THE Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. [3416

PUBLIC APPOINTMENTS

SENIOR scientific officers: scientific officers. The Civil Service Commissioners invite applications for pensionable appointments. Applications may be accepted up to 31st December, 1955, but early application is advised as an earlier closing date may be announced. Interview boards will sit at frequent intervals. The scientific posts cover a wide range of scientific research and development in most of the major fields of fundamental and applied science. In biological subjects the number of vacancies is small: individual vacancies exist for candidates who have specialised in palaeobotany, foraminifera, malacology and lichenology.

CANDIDATES must have obtained a university degree with first or second class honours in an appropriate scientific subject (including engineering) or in mathematics, or an equivalent qualification; or possess high professional attainments. Candidates for senior scientific officer posts must in addition have had at least three years' post-graduate or other approved experience.

CANDIDATES taking their degrees in 1955 may apply before the result of their degree examination is known.

AGE limits: senior scientific officers, between 26 and 31, but specially suitable candidates under 26 may be admitted. For scientific officers betwen 21 and 28 during 1955 (up to 31 for permanent members of the experimental officer class). Salary (London) senior scientific officers: (men) £1,010-£1,185; (women) £875-£1,060. Scientific officers, (men) £492-£885; (women) £492-£780. Somewhat lower rates in the provinces.

FURTHER particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting S.53/55 for senior scientific officers and S.52/55 for scientific officers.

ROYAL Mint has a vacancy to be filled as scientific officer or senior scientific officer according to qualifications and experience. Candidates must have first or second class honours degree in metallurgy, or in physics and chemistry if with metallurgical experience. The general qualifications and conditions are as set out in the main advertisement above. Candidates for this post should quote S.4424/53/55 and the closing date for applications is 30th April, 1955. [3512

ADMIRALTY, LONDON, require electrical (Order No. Bath 277) and mechanical (Order No. Bath 278) draughtsmen on work associated with aircraft maintenance and repair. British subjects only at least 21 years old with practical experience in workshop (preferably apprenticeship) and drawing office. Knowledge of repair of airframes and aero-engines for mechanical posts, and of aircraft electrical installations and maintenance of either radio or electrical and instrument equipment for electrical posts desirable. Salary according to age, quals. and experience within £420—£670 p.a. plus pay supplement £22-£25. Payment for overtime. Annual leave 24 days rising to 28 days after three years. Posts temporary but prospects of establishment. Apply, stating age, technical quals. and full details of experience to any Employment Exchange quoting relevant Order No. [3504

METEOROLOGICAL Office, Scientific Officers. The Civil Service Commissioners invite applications for permanent posts. Applications will be accepted up to May 31st but early application is advised. The duties include research in atmospheric physics, covering the study of cloud structure, synoptic and dynamical meteorology, large and small scale diffusion and turbulence, climatology and development of instruments. There is a limited number of posts for forecasting work at the more important centres. Successful candidates will be given a course in meteorology before being assigned to a research or forecasting establishment for further training and experience. In some instances candidates with national service obligations can be commissioned in the R.A.F. for forecasting duties at R.A.F. stations. Further information may be obtained from the Director, Meteorological Office (M.O.10), Air Ministry, Kingsway, London, W.C.2.

CANDIDATES must be between 21 and 28 during 1955 (up to 31 for permanent members of the Experimental Officer class) with a First or Second Class Honours degree preferably in physics or mathematics. Salaries £492-£885 (London rates for men; somewhat lower for women and in the provinces). Opportunities for promotion to Senior Scientific Officer (£1,010-£1,185), and higher posts.

APPLICATION forms from Civil Service Commission, Scientific Branch, 30 Old Burlington Street, London, W.1, quoting No. S.52/55. (Met.). [3511

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(2) ICING TECHNOLOGIST

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(3) ICING TECHNOLOGIST (Junior)

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(7) DESIGNER DRAUGHTSMAN

H.N.C. or equivalent, experience in the design of mechanical linkages, movement control devices, and medium size manufacturing machines. To work on the design of specialised apparatus for the production of aircraft de-icing equipment.

(8) SERVICE ENGINEER

Engineering apprenticeship (preferably electrical) with an aircraft background. Experience in sprayed metal and synthetic resin field an advantage. To be able to advise users on methods of inspection, maintenance, and repair of aircraft de-icing equipment. Selected applicant will be given suitable training in both practical and technical aspects of the work involved.

(9) PRODUCTION ENGINEER

Young man with production engineering qualifications, engineering apprenticeship with aircraft background, production experience preferred but not essential. For estimating, planning, and production control of aircraft de-icing equipment.

Applicants should state clearly the vacancy applied for and give fullest possible details of experience and qualifications and when they would be available for interview, to

Dept. C.P.S.,
336/7 Strand, W.C.2
quoting Ref. No. 1368H.

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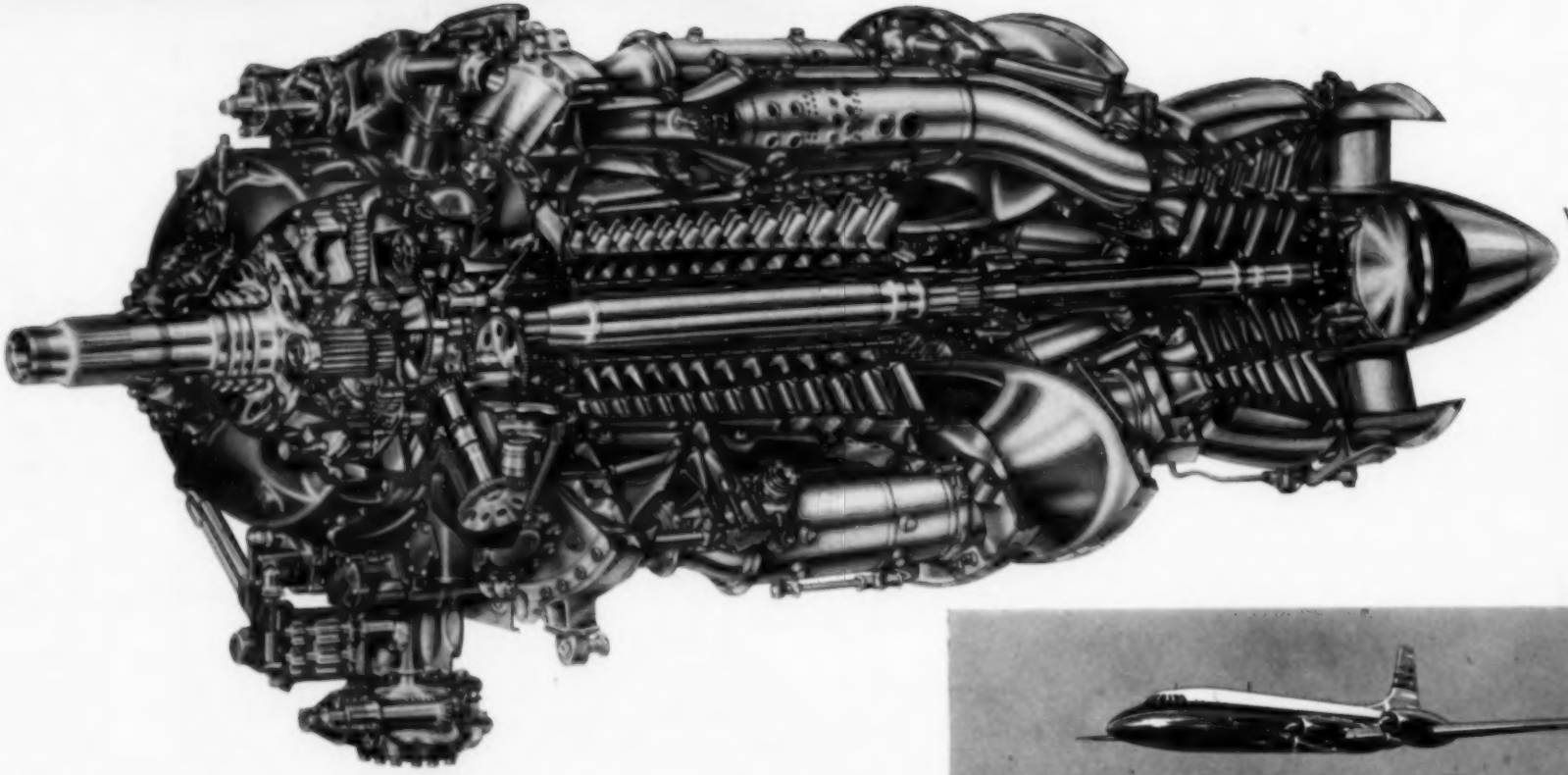

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